

DISEASES

of the

CHEST

OFFICIAL PUBLICATION



PUBLISHED BI-MONTHLY

JULY - AUGUST

1947

PUBLICATION OFFICE, ALAMOGORDO ROAD, EL PASO, TEXAS
EXECUTIVE OFFICE, 500 NORTH DEARBORN STREET, CHICAGO 10, ILLINOIS

Entered as Second Class Matter August 18, 1936, at the Postoffice at El Paso, Texas
Under the Act of Congress of August 12, 1912.

Copyright, 1947, by the American College of Chest Physicians



Where the science of treatment is first

ROCKY GLEN SANATORIUM **McCONNELSVILLE, OHIO**

FOR THE MEDICAL AND SURGICAL TREATMENT OF TUBERCULOSIS

LOUIS MARK, M.D., Medical Director, 677 North High Street, Columbus, Ohio

HARRY MARK, Superintendent

MRS. H. A. PHILLIPS, Asst. Superintendent

FRANK LANDE, M.D.
Resident Medical Director

HENRY BACHMAN, M.D.
Consultant

Beautiful Surroundings

Graduate Nurses

Reasonable Rates



THE CALIFORNIA SANATORIUM

BELMONT, CALIFORNIA

Located in the well-known sunny belt of the Peninsula, about thirty miles south of San Francisco. Large park, semi-tropical grounds, walks, especially laid out for graduated exercise.

Not too hot in summer — not too cold in winter.

Physicians on duty day and night — Graduate nurses.

THOMAS B. WIPER, M.D., Director and Consultant in Thoracic Surgery
W. N. TORRE, M.D., Resident Clinician

SAN FRANCISCO OFFICE: 450 SUTTER STREET

PHONE: DOUGLAS 5793



Where the science of treatment is first

ROCKY GLEN SANATORIUM **McCONNELSVILLE, OHIO**

FOR THE MEDICAL AND SURGICAL TREATMENT OF TUBERCULOSIS

LOUIS MARK, M.D., Medical Director, 677 North High Street, Columbus, Ohio

HARRY MARK, Superintendent

MRS. H. A. PHILLIPS, Asst. Superintendent

FRANK LANDE, M.D.,
Resident Medical Director

HENRY BACHMAN, M.D.,
Consultant

Beautiful Surroundings

Graduate Nurses

Reasonable Rates



THE CALIFORNIA SANATORIUM

BELMONT, CALIFORNIA

Located in the well-known sunny belt of the Peninsula, about thirty miles south of San Francisco. Large park, semi-tropical grounds, walks, especially laid out for graduated exercise.

Not too hot in summer — not too cold in winter.

Physicians on duty day and night — Graduate nurses.

THOMAS B. WIPER, M.D., Director and Consultant in Thoracic Surgery
W. N. TORRE, M.D., Resident Clinician

SAN FRANCISCO OFFICE: 450 SUTTER STREET

PHONE: DOUGLAS 5793

DISEASES *of the* CHEST

VOLUME XIII

JULY-AUGUST, 1947

NUMBER 4

Inhalation Therapy in Chronic Bronchial Infections

EDWIN R. LEVINE, M.D., F.C.C.P.*

Chicago, Illinois

THE PROBLEM

Chronic bronchial infections are notoriously resistant to methods of treatment. The pathology and physiology of this condition give adequate reason for their resistance to therapy. Pathologically, the bronchial walls are thickened and fibrosed with a marked decrease in the blood supply to the infected areas. The involved bronchi are constantly filled with purulent secretion, and there is frequently some anatomical obstruction to free drainage. From a physiological standpoint we observe very definite deviations from the normal. These bronchi are more irritable and much more liable to spasm than are normal or even acutely inflamed bronchi. On bronchoscopy one can visualize irregular spasm which produces the picture of local constriction. Thus, without any definite anatomical obstruction it is possible to have interference with drainage caused by muscular contraction. This is most marked with forced expiration and is particularly seen in cough. The retention of secretion that is produced by this mechanism is one of the factors in chronicity of bronchial infections.

Further evidence is found to explain the failure of medication which depends upon the blood stream to reach the infected area. In almost all cases, if not in all cases, there is a very marked decrease in ventilatory activity in the region of the bronchial infection. This, as has been shown by Hamilton,¹ is accompanied by marked decrease in blood supply to this area. Thus, we find that regardless of the blood level obtained with the use of any agent that little of the agent in question reaches the infected area; and

*From the Chest Service of Michael Reese Hospital, Chicago, Illinois, and the Winfield Sanatorium. Aided in part by a grant from the Susan Wein Foundation. Presented at the 12th Annual Meeting, American College of Chest Physicians, San Francisco, June 28, 1946.

when it does, the little that does has difficulty in penetrating the barriers that the body itself has thrown about the infected area. The very absence of elevated temperature and toxic symptoms during the chronic phase of this disease is indication that little exchange of any sort goes on between the infected areas and the blood stream. It is for this reason that inhalation of a therapeutic agent would appear to be more valuable than the application of that same agent by any other means.

A fine mist or aerosol can be produced as shown by Castex,² Krueger,³ Barach⁴ *et al*, and inhaled with the inspired air. The concentration of the medication in question should reach a sufficient level at the site of infection to produce the desired result. The following experimental work was done to determine as accurately as possible, whether this method of therapy actually affected the diseased bronchi.

SELECTION OF MATERIAL

It was necessary, first, to rule out any improvement that could not be attributed to the inhalation therapy. Spontaneous improvement in chronic bronchial infection is a common occurrence. Patients frequently show marked change with feeling of well being, decreased cough and expectoration and with almost complete absence of other symptoms simply on being put to bed, and as a result of general constitutional care. Furthermore, if adequate



Figure 1



Figure 2

Fig. 1: H. C., 54 year old man with long history of cough, expectoration and disability. Bronchography shows areas of cystic bronchiectasis in the left mid-lung field and cylindrical bronchiectasis in the right and left lower lung fields. An emphysematous area in the left base has crowded the remainder of the parenchyma and the lower bronchi towards the mediastinum.—*Fig. 2:* H. C., Lateral view of bronchography showing cylindrical, saccular, and cystic bronchiectasis.

drainage can be established, many chronic bronchial infections, even with bronchiectatic changes present, will show marked improvement and some times complete clearing of symptoms. The following case illustrates this point.

H. C., a 54 year old laborer, with a history of severe cough and profuse expectoration for a period of a great many years. This became so severe and produced such marked weakness and dyspnea that patient was unable to continue work, and for 4 years was completely disabled by symptoms. X-ray film of the chest showed suspicious shadows in the left mid-lung field, and bronchogram indicated cystic, saccular, and cylindrical bronchiectasis (Figs. 1, 2). He was placed on a regimen of rest, postural drainage, and antispasmodic cough medication, and began to show very marked improvement with decrease in cough and expectoration. After a period of several months, he was able to climb stairs, returned to light work, and then to regular work. He has been engaged in full-time work without any recurrence of his illness for the past two years.

Thus, we see that even in patients of advanced years a long-standing history, definitely demonstrable x-ray changes, and markedly increasing symptoms, marked relief which is lasting may be obtained by postural drainage and symptomatic treatment alone. Furthermore, some of these patients will show marked relief, if not cure, by the use of chemotherapy or antibiotics orally or parenterally. Some patients show little if any symptoms despite extensive anatomical bronchiectasis.

A. P., a 32 year old female whose general health was good with no history of cough, expectoration, or respiratory symptoms except an occasional cold. She had a sudden hemoptysis amounting to about a dram

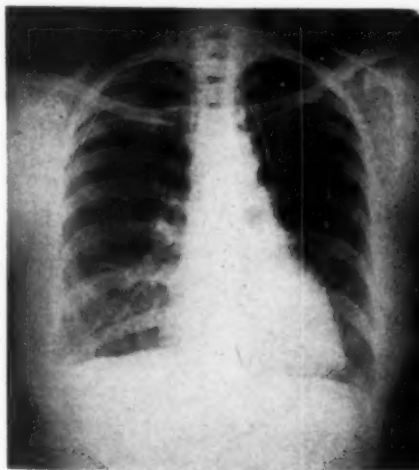


Figure 3



Figure 4

Fig. 3: A. P., 32 year old female. No cough, no expectoration, had sudden hemoptysis. X-ray shows some slight increase of markings at left base.—
Fig. 4: A. P., Bronchography indicating extensive saccular and cystic bronchiectasis of the right lung existing despite complete absence of symptoms.

and a half. X-ray showed no particular pathology, with some suggestion of increased markings at base (Fig. 3). Bronchography with contrast medium showed a very extensive saccular bronchiectasis in the right lower lung field (Fig. 4). No particular treatment was instituted, and the patient has remained well with no symptoms of any sort.

Secondly, it is necessary to rule out any effect that may be obtained by the absorption of the agent through the alveoli and its action through the blood stream rather than directly. For this reason the following criteria were used on all of the patients in this experimental group:

1. There must be definite bronchographic evidence of bronchiectasis.
2. There must be a history which is definitely of this type of infection for a long period of time.
3. All of the patients should have been previously treated by all other methods of medical treatment including bed rest, postural drainage, sulfonamides by mouth and penicillin by injection.

Bronchographic evidence of bronchiectasis was found in all patients included in this group. All except four of the patients had

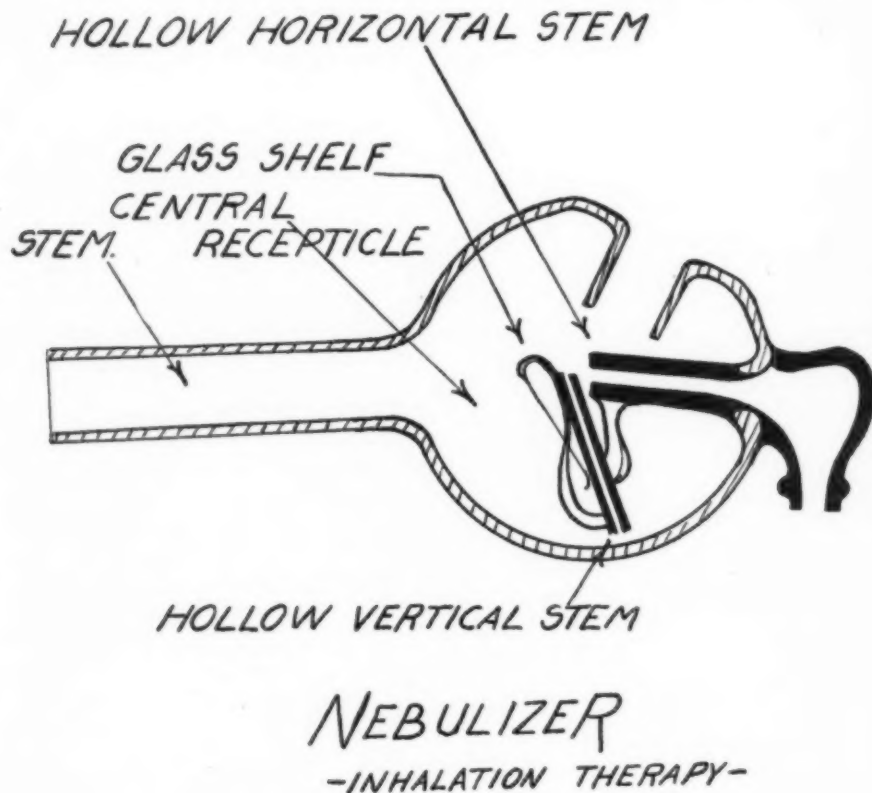


Figure 5: Diagram of Vaponefrin nebulizer.

a history of symptoms for 20 years or more. All cases had received medical treatment, sulfonamides and penicillin previously without any effect. It was felt that by adhering to these three criteria that if any improvement was obtained by inhalation therapy, it would be fair to ascribe that improvement to the therapy and not to any accidental or spontaneous improvement. This would appear to be more accurate than selecting an equal number of controls although a similar series of patients under treatment in our clinic has also been used as control.

THE METHOD

Penicillin was used as the agent of choice because its action is not inhibited by presence of pus. No attempt was made to use a great many different agents since the purpose of this investigation was to determine the efficacy of inhalation treatment and not that of a particular drug. The apparatus used was the glass nebulizer known as the Vaponefrin vaporizer (Fig. 5). This, as can be observed, is an all-glass device which produces a microscopic spray in a relatively cylindrical form (Fig. 6). The patients were instructed to hold the nebulizer at a distance of 2" from their mouth, and keeping the mouth wide open, to inhale and exhale deeply.

The various types of apparatus that have been described in the literature were tried and did not appear to be as simple in use nor as efficacious as the uncomplicated nebulizer itself. Further, it appears that if the tip of the nebulizer is put in the mouth instead of being left outside, the spray will strike and adhere to the cheeks, tongue, and pharynx, and thus only a small part of it be inhaled into the bronchial tree. If it is held at this slight distance from the mouth, the vapor mixes better with the inspired air.

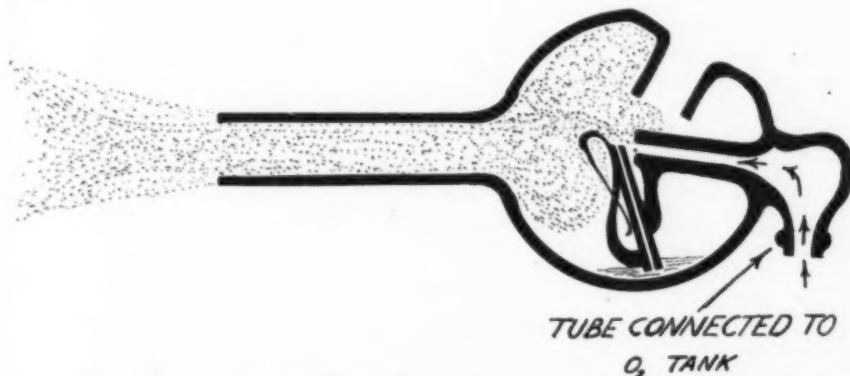


Figure 6: Diagrammatic representation of production of spray in a relatively cylindrical form for about 2 inches after leaving nozzle of nebulizer. For this reason it is more efficacious to place the nozzle about 2 inches from the mouth and allow the fine mist to mix with the inspired air.

The penicillin used was both the sodium and calcium salts of any manufacturer which our pharmacy department happened to have on hand at the time. This was dissolved in normal saline solution and administered in concentration varying from 1,000 U. per c.c. to 20,000 U. per c.c. As will be indicated later the concentration *per se* did not appear to be an important factor in the determination of the result. The amount used was one c.c. for each administration. In our earliest work about 2 years ago the patients were instructed to inhale the penicillin solution once in 3 hours. As time went on, we increased the frequency as well as the concentration, and soon had our patients using the treatment on an hourly basis. However, as will be indicated later, this again did not seem to show the degree of importance in the handling of these cases that would be expected.

PATIENT GROUP

Forty-two patients fulfilling the above three criteria were used in this experimental group. These patients were 26 males and 16 females. The age ranged from 8 to 80 years; however, with the exception of 4 patients, they were all adults with an average age of 50 years. The duration of symptoms ranged from 8 years to 64 years. Only 4 of the patients had history of less than 20 years duration, and these 4 ranged from 8 to 14 years. Twenty-eight of the thirty-eight had histories of 28 or more years of steady bronchiectatic symptoms; so that there was no patient in this group with a duration of less than 8 years, and with an average duration of 25 years for the entire group. Every patient in this series showed cough, profuse and purulent expectoration, recurrent pneumonias, while 33 had hemoptysis, marked dyspnea, and long periods of, or constant complete disability. Bronchoscopy was performed to determine the extent of major bronchial damage and to rule out possible tumors. Bronchography followed to establish the necessary criterion that there be saccular or cylindrical bronchiectasis shown on x-ray. Every patient was under observation for a period of time before the start of treatment. Postural drainage, cough medication, vitamin A, and general constitutional measures were used without effect. Sulfonamides by mouth were administered in every case without noticeable improvement, and penicillin by intramuscular injections. Any patient showing improvement by these means was dropped from the series. Culture of bronchial secretion was taken by bronchoscopy and by technic of direct expectoration into a sterile petri dish. The similarity of the culture by the two methods, when a careful sputum technic is used, seems to make the bronchoscopic smears unnecessary for accurate work.

ORGANISMS

The sputum was cultured, organisms identified, and their sensitivity to penicillin determined. A great many different organisms appeared in the sputa. Hemolytic streptococcus, streptococcus viridans, anhemolytic streptococcus, staphylococcus aureus, bacillus proteus and Friedlander's bacillus, were the most common organisms found.

TABLE I

Strep. Viridans	23
Hemo. Strep.	16
Anhemolytic Strep.	15
Staph. Aureus	12
Neisseria	12
B. Proteus	6
Friedlander's	5
M. Catarrhalis	4
H. Influenzae	4
Staph. Albus	4
Alpha. Strep.	2
B. Coli	2
Hemo. Staph.	2
Diphtheroid	1
Gram Neg. Bacilli	1

The very frequent occurrence of streptococcus viridans, which is not customarily expected in bronchial infections, was a point of more importance than was anticipated.

RESULTS

Treatment was started at the beginning of this series in 1944 using 1,000 U. of penicillin per c.c. The patients were instructed to nebulize 1 c.c. of this solution every 3 hours. Treatment continued over a period of 3 to 4 weeks. Eighteen patients were thus treated with what is now considered a very low concentration of penicillin. In this group of 18, ten patients showed complete clearing of cough and expectoration and the abolition of all symptoms. Four patients showed very marked improvement, but still continued to cough in the morning. One patient showed some improvement, but still had symptoms, and three showed no improvement.

It was noted that some patients who showed such marked relief showed no change in their bronchographic picture, and a great many of them had a recurrence of symptoms following the next upper respiratory infection. Bacteriological studies indicated that the organisms found at the time of the recurrence were not the

same organisms that were present before treatment, indicating a new infection which had taken place in the already pathologic bronchial tree. With recurrences these patients were treated using high concentration of penicillin varying from 5,000 U. per c.c. to 20,000 U. per c.c. During this period we also increased the dosage on all of the new patients who were studied, and all of these patients were started on increased concentration, 10,000 U. per c.c. at first and 20,000 U. per c.c. in some of the cases. In the entire group of forty-two cases, 19 patients showed complete cessation of symptoms and abolition of cough; 14 patients showed relief with no constitutional symptoms and little or no expectoration, although cough continued; and 8 showed insufficient change to be considered a good clinical result. Of the 33 patients in whom improvement was noted, only 9 maintained this improvement without recurrences. The other 24 patients had 34 recurrences in all. As was noted before, these recurrences were accompanied by change in the bacterial flora, indicating a new and not a recurrent infection.

RECURRENCE AND REINFECTION

This high incidence of recurrence of symptoms which was actually a new infection or a reinfection in a diseased area is perhaps the most typical clinical finding in bronchiectasis. We have always known that bronchiectasis has its good periods and bad periods. In the light of these findings, it would be reasonable to suppose that just as upper respiratory infection was followed by deep infections in the bronchial tree in these cases where the bacteria had been destroyed or rendered inactive, we may assume that customarily in bronchiectasis, the flare-up may be due in part to new organisms implanted on an old infection.

The 9 patients who had no further recurrences were individuals who despite their lack of symptoms followed a regime of postural drainage and regular hours. In the others, further breakdowns were avoided by placing patients on such a regime following the second or third infection. In some of our patients mild respiratory symptoms appeared from time to time—cough, wheezing with little or no evidence of deep infection, which was not classified as recurrence of bronchiectasis. This was treated by cough medication designed to liquefy the sputum and relieve bronchial spasm, and postural drainage. It was found that this was sufficient to prevent more severe symptoms in almost all cases.

CONCENTRATION OF PENICILLIN

In almost all of these cases no significant level for penicillin was secured although high blood levels in normal patients inhaling

similar concentrations of penicillin have been obtained. This we feel can be explained by the pathological changes present in these old chronic cases, and the failure of any absorption from the bronchial tree. The good clinical result and the disappearance of the bacilli from the bronchial tree indicate that the effect of the penicillin used was directly by inhalation and not indirectly by absorption and production of an adequate blood level.

The following case histories, one of a young patient and one of an older patient are typical of the good results obtained.

1. F. K., a 14 year old girl. Onset of symptoms of bronchiectasis began in infancy following pneumonia. She had constant cough, expectoration, irregular temperature, and recurrent pneumonic syndrome all of her life. X-rays of chest show very little change. Bronchogram showed extensive bronchiectasis in the left lower lobe with a smaller amount of similar pathology on the right (Figs. 7, 8). She was hospitalized, and culture of sputum secured at bronchoscopy, strept. hemolyticus, strep. viridans, staph. albus., were isolated, and a series of penicillin injections given—200,000 U. a day for a period of one week. Sulfonamides had been used extensively before hospital admission. There was no noticeable improvement in symptoms or clinical condition. After a 2 week rest during which time the patient was on postural drainage with no further improvement, inhalation of penicillin solution (1,000 U. per c.c.) was instituted. Symptoms disappeared completely at the end of the first week. This treatment was continued, however, for a period of 4 weeks. She remained completely well without any symptoms until she contracted a severe cold 10 months later. All symptoms returned. On this occasion a bronchopneumonic patch was found in the right lung, and alpha streptococcus and staphylococcus albus recovered in the sputum. She was placed



Figure 7

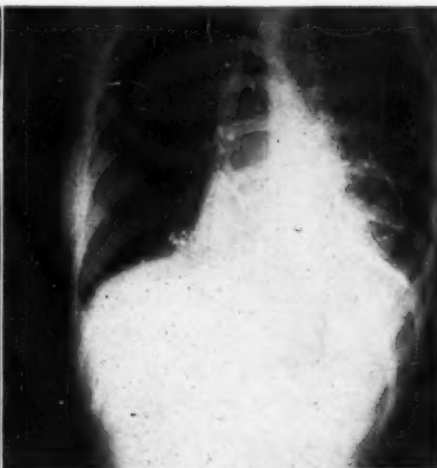


Figure 8

Fig. 7: F. K., 14 year old female. With cough, expectoration, and recurrent pneumonias since early infancy. Bronchography showing extensive abscess and bronchiectatic areas in left base and some sacular bronchiectasis close to the mediastinum on the right.—Fig. 8: F. K., Left oblique x-ray showing the bronchiectatic areas in the left base more clearly. Bronchiectasis in the right is seen behind the heart shadow.

on penicillin inhalation (5,000 U. per c.c.) and postural drainage. The chest cleared up, and her cough disappeared at the end of one week. Six months later there was a similar recurrence of symptoms which cleared up completely in 2 weeks treatment of penicillin inhalation.

2. S. S., a 45 year old patient in whom bronchiectasis was diagnosed as such 20 years ago, and who had been treated with large amounts of each sulfonamide compound successively and had received 2,000,000 U. of penicillin by injection (Figs. 9, 10). This patient suffered from constant cough and copious, often foul, expectoration, cyanosis, clubbing of fingers, recurrent periods of complete disability ranging from 1 to 6 months. Sputum studies showed hemolytic streptococcus and staphylococcus aureus. Treatment was started using penicillin solution 1,000 U. per c.c. He showed a marked improvement with decrease of cough and expectoration and complete disappearance of cyanosis. A month after start of treatment, he acquired a severe respiratory infection, and at the time sputum culture showed hemolytic streptococcus and alpha streptococcus. The concentration of penicillin was increased to 5,000 U. per c.c., and he was continued on this therapy for another 3 months. During this period postural drainage was used twice a day. His dyspnea and cyanosis disappeared completely, and there was a gradual return of energy as cough and expectoration ceased entirely for the first time in 20 years. He started to engage in business activity and returned to full-time work as salesman, and has had no recurrence of symptoms for a year.

DISCUSSION

The results obtained from this study would seem to indicate that medication inhaled as an aerosol has a definite therapeutic effect in chronic bronchial infections. The group of cases selected for this purpose removed the possibility of spontaneous improvement or of improvement due to general medical attention and

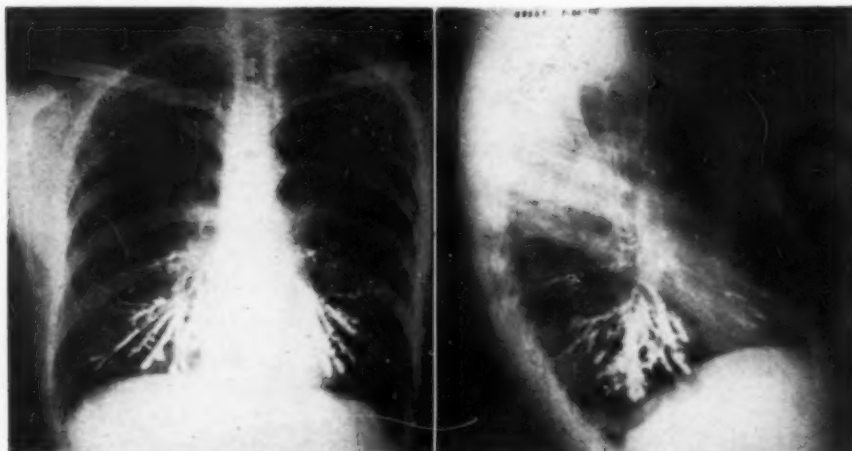


Figure 9

Figure 10

Fig. 9: S. S., 45 year old male with 20 year history of known bronchiectasis. Bronchography shows extensive saccular bronchiectasis in both lower lobes.—
Fig. 10: S. S., Lateral x-ray showing saccular bronchiectasis at base.

increased drainage. Since chemotherapy had been tried by many orthodox methods before inhalation therapy and since the blood level was not found to be sufficient in any case, we must come to the conclusion that any improvement was due to the direct, topical action of the penicillin on the bronchial mucosa. The variations in result can be attributed to the type of organisms involved. Where the study showed an organism sensitive to penicillin, a good and fairly rapid result was obtained. In those cases where the organism was relatively resistant, a longer period of treatment was needed, a higher concentration necessary and a less definite result secured. And in the group of cases in which no improvement was noted, the organisms in all cases were gram negative bacteria and other bacteria on which penicillin has little effect. If we classify our cases according to their penicillin sensitivity, we have had 100 per cent good results in patients whose bronchial lesion was caused by penicillin sensitive organisms, and 100 per cent bad results in cases where the organism was penicillin resistant. The moral of this is clear. Inhalation is a method of bringing an agent in contact with pathogenic bacteria. It can do no more than that. It is interesting that inhalation of sulfonamides first reported by Castex and his co-workers² has produced some good results. A much more important step is the report of Olsen⁵ on the combined use of streptomycin and penicillin, and the excellent results obtained by this means. We may, therefore, say that inhalation therapy has a definite and unquestioned value in the treatment of bronchial infection, and that the limitations are those of the chemotherapeutic agent and not of the technic. From our own and the experience of others, we can extend this technic to all bronchial or bronchopulmonary infections since the most resistant group, the group most difficult to treat, the long-standing bronchial infection with fibrosis and emphysema has shown response to this method.

A further point of great interest was the large amount of recurrent or new infection that settled in this area of diseased bronchi. It is quite evident that inhalation is only one of the measures of medical treatment, and it is important for the physician to follow his case of chronic bronchial infection carefully and for a long period of time. As has been shown in this series, recurrence of symptoms may be frequently prevented by the use of medication and postural drainage. And when these symptoms become more troublesome, another course of inhalation therapy is indicated.

The experience with other bronchopulmonary infections which have responded to one or another type of treatment, has led us to believe that if infection can be kept away from the pathological

bronchi for a sufficiently long time, it is not too much to expect that the pyogenic membrane can be replaced by bronchial epithelium. Thus we may have as an end-stage, anatomical dilatation epithelialized without infection or retention of secretion, and thus no clinical bronchiectatic disease.

SUMMARY

1. A study has been made to determine the efficacy of inhalation therapy in bronchial infection. To rule out spontaneous remission, improvement by medical treatment, and the production of the effect by a blood level of penicillin the following criteria were used in selection of cases:

- a. There must be definite bronchographic evidence of bronchiectasis.
- b. There must be a history which is definitely of this type of infection for a long period of time.
- c. All of the patients should have been previously treated by all other methods of medical treatment including bed rest, postural drainage, sulfonamides by mouth and penicillin by injection.

2. Forty-two patients satisfying these criteria were treated over a period of two years. All of the patients have been followed for at least 1 year.

3. Of the 42 patients there were 19 cases of complete disappearance of symptoms; 14 cases of marked improvement in symptoms and general condition, although some symptoms remained; and 8 cases in which no clinical improvement could be found. Recurrence of symptoms with an entirely new bacterial flora as indication of new infection was the rule rather than the exception.

4. The concentration of penicillin per c.c. in the nebulized solution did not appear to be an important factor *per se*. The sensitivity of the organism to penicillin was the most important factor in the determination of the result.

5. Inhalation therapy appears to be a definite method of treatment with a definite effect upon bronchial disease. Its efficacy is limited by the effectiveness of the chemotherapeutic agent used.

6. Continued medical supervision and customary means of treatment including postural drainage remains an essential element in the treatment of chronic bronchial infections.

RESUMEN

1. Se ha llevado a cabo un estudio con el objeto de determinar la eficacia de la terapia de inhalación en la infección bronquial. Para eliminar la remisión espontánea, la mejoría debida al trata-

miento médico y la producción del efecto por el nivel sanguíneo de penicilina, se observaron los siguientes requisitos en la selección de casos:

- a. Deben existir pruebas broncográficas bien definidas de bronquiectasia.
 - b. Debe existir una historia por un largo período de tiempo que es definidamente de este tipo de infección.
 - c. Todos los pacientes deben haber sido tratados previamente mediante todos los otros tratamientos médicos, inclusive del descanso en cama, la canalización por postura, las sulfonamidas por la boca y la penicilina por inyección.
2. Se trató por un período de dos años a 42 pacientes que cumplieron estos requisitos. Se ha observado a todos los pacientes por un período de un año por lo menos.
3. De los 42 pacientes hubo 19 casos en los que los síntomas desaparecieron por completo; 14 casos de marcada mejoría de los síntomas y de la condición general, aunque quedaron algunos síntomas; y 8 casos en los que no se notó ninguna mejoría clínica. El retorno de los síntomas con una flora bacteriana enteramente distinta, indicativa de una nueva infección, fue la regla más bien que la excepción.
4. La concentración de penicilina por centímetro cúbico en la solución pulverizada no pareció ser de sí mismo un factor importante. El factor más importante para determinar el resultado fue la sensibilidad de los organismos a la penicilina.
5. La terapia de inhalación parece ser un tratamiento que ejerce un efecto bien definido sobre la enfermedad bronquial; aunque limita su eficacia la efectividad del agente quimioterapéutico usado.
6. La supervigilancia médica prolongada y los métodos usuales de tratamiento, inclusive la canalización por postura, continúan siendo elementos esenciales en el tratamiento de infecciones bronquiales crónicas.

REFERENCES

- 1 Hamilton, W. F.: "Physiology of the Circulation," New York, Oxford University Press, "To be Published."
- 2 Castex, M. R., Capdehourat, E. L., and Pedace, E. A.: "Inhalation de substancias nebuli a cedos," *Arch. Argent. de. Enjerm. d. Ap. Resp. y Tuberc.*, 9:1, 1934.
- 3 Krueger, A. P.: Personel of Naval Laboratory Research Unit 1401, "The Inhalatory Route for Prophylaxis and Treatment of Exp. Influenza," *Am. J. Med. Sci.*, 207:40-60, 1944.
- 4 Barach, A. L., Silberstein, F. H., Oppenheimer, E. T., Hunter, T., and Soroka, M.: "Inhalation of Penicillin Aerosol in Patients with Bronchial Asthma, Chronic Bronchitis, Bronchiectasis, and Lung Abscess," *Ann. Int. Med.*, 22:485-509, 1945.
- 5 Olsen, A. M.: "Streptomycin Aerosol in the Treatment of Chronic Bronchiectasis," *Proc. Staff. Meet., Mayo Clinic*, 21:53-54, 1946.

Discussion

JAMES S. EDLIN, M.D., F.C.C.P.

New York, New York

This subject that Dr. Levine presented is of intense interest to all physicians and especially to those engaged in the practice of diseases of the chest. With the increase in our knowledge of bronchial diseases and with the increase in diagnosis of unsuspected cases by the use of mass x-ray surveys we have found the problem of bronchial infections to be of extreme importance.

During the years of 1944 and 1945 I had the opportunity, in association with Drs. Sydney Bassin, I. D. Bobrowitz, and J. Stanley Woolley, to perform studies on a group of cases of bronchiectasis at St. Clares Hospital, New York City, and the Municipal Sanatorium, at Otisville, New York. The results of these studies were published in the *New England Journal of Medicine* on January 31, 1946. I should like to present a summary of our work and our conclusions which I believe you will find interesting in connection with the topic that was presented today by Dr. Levine.

"Although penicillin therapy cannot alter the irreversible destructive changes in bronchiectasis, the findings in 12 cases of severe bronchiectasis treated with penicillin suggest the possibility of control of bronchiectasis and a means of preoperative preparation for lung resection because of bronchiectasis.

Patients ranged in age from 16 to 30 years and included 10 men and 2 women. Seven patients were followed for 1 to 6½ months after treatment, 2 were not followed, and 3 were still being treated (as long as 16 or more weeks).

Diagnosis was made in all cases by lipiodol bronchograms. There were 33 bronchiectatic lobes in the 12 patients, with marked secular involvement in 19, moderate involvement in 3, moderate cylindrical and varicose dilatations in 6, slight cylindrical enlargement in 5, and atelectasis in 2. Symptoms had persisted from 4 to 24 years, more than 10 years in all but 2 patients. One patient had a coexistent tuberculosis. Sinus involvement was evident in 2 cases.

Sputum examinations were made before, during and after treatment. Gram stained smears were made of 24-hour collections of each specimen. Cultures were done occasionally. Sputum was purulent in all cases and was characterized by a foul odor in all but 2 cases. Both gram positive and gram negative organisms were present in all smears, the gram positive predominating. The number of organisms present was proportionate to the purulence of the sputum.

Penicillin was administered intramuscularly only in 1 patient (100,000 units daily to a total of 550,000 units in 5½ days), intramuscularly and intratracheally in 1, intratracheally only in 4, inhalation only in 3, and intratracheally and by inhalation in 2.

Postural drainage was used 2 or 3 times daily throughout hospitalization. Intratracheal penicillin was administered by the supraglottic method after topical cocaineization. In 1 case an intratracheal catheter was used.

The patient treated intramuscularly showed a penicillin sputum concentration of 0.4 U./cc., while blood levels ranged from 0.2 to 0.4 U./cc.; 1 patient receiving 1,000,000 units intratracheally over a period of 10 days, showed a penicillin sputum titer of 284 U./cc. Three patients receiving 1,000,000 units intratracheally for 4 days showed sputum concentrations of 831,552 and 159 U./cc. respectively, and blood levels of 0.1, 0.25, and 0.45 U./cc. respectively. Penicillin excretion did not persist as long as in the patient receiving therapy for 10 days. A subsequent patient receiving 1,500,000 units intratracheally over a period of 30 days showed a sputum concentration of 101 U./cc. and blood levels of 0.1 to 0.25 U./cc. Results were not as good as in the patient treated for 10 days.

Inhalation therapy with 1,500,000 units in 30 days resulted in an average sputum concentration of 13 U./cc., and blood levels of 0.0 to 0.2 U./cc. Therapeutic results were, however, evident. A total of 4,000,000 units administered in 60 days gave a sputum concentration of 86 U./cc.

All patients showed a decrease in the amount of sputum, a lessening of odor, disappearance of all gram positive organisms (7 patients) and a decrease in gram negative ones during treatment. The effect was more rapid with intratracheal administration (2 to 4 days) than with inhalation (a week or two). When penicillin was stopped, these symptoms recurred after periods of a few days to several weeks, but not to the same degree as before treatment.

We concluded that although results with intratracheal administration were more rapid, the inhalation method may be preferable because of simplicity of administration and the long period of treatment required. We therefore suggest that intratracheal instillations be used initially and followed by inhalation therapy. Therapy must be continued for long periods and may need to be repeated at intervals indefinitely. The results may be elimination of bacterial infection and expectoration with ensuing repair.

For preoperative preparation of patients with bronchiectasis, a brief intensive course of penicillin intratracheally—100,000 units daily—is recommended."

Discussion

ARTHUR M. OLSEN, M.D.

Rochester, Minnesota

In the brief time allotted me I should like to summarize our experience at the Mayo Clinic with the aerosol therapy of bronchiectasis. I think you will agree that our results tend to substantiate the two major conclusions reached by Dr. Levine; namely, first, that aerosols are effective in the treatment of chronic bronchial infections and, second, that the organisms present in the secretions must be sensitive to the antibiotic agent.

Our methods of treatment were quite similar to those employed by Dr. Levine. Eighty-six patients who had proved bronchiectasis have been treated at the Mayo Clinic by means of aerosol therapy. In forty-six cases, the method was used as a means of preparing patients for pulmonary resection. The remaining forty patients had bilateral nonsurgical bronchiectasis. All eighty-six patients received treatment with penicillin aerosol. A very striking reduction in the volume of pulmonary secretions or complete relief occurred in slightly more than 50 per cent of the cases. In twenty-seven cases combined streptomycin and penicillin aerosols were administered after a period of treatment with penicillin aerosol only. In 90 per cent of these cases there was a striking reduction of the volume of sputum.

Periods of treatment in the surgical group varied from four days to four weeks. In the nonsurgical group aerosol therapy was administered for two to eight weeks. Most of the patients used penicillin sodium in a concentration of 10,000 units per cubic centimeter and nebulized 200,000 to 300,000 units daily. Careful bacteriologic studies were carried out including in vitro tests of sensitivity to penicillin and streptomycin. Streptomycin was used only in cases in which gram-negative organisms were predominant in cultures. The daily dosage of streptomycin varied from 500,000 to 1,000,000 units daily. Usually we mixed 200,000 units of penicillin sodium and 500,000 units of streptomycin hydrochloride in 20 to 30 c.c. of physiologic salt solution.

Recurrences following cessation of therapy were common. Many of our patients are continuing penicillin nebulization on a modified scale at home in order to remain free of sputum. Devices which provide air pressure can be employed instead of compressed oxygen and are equally effective.

The development of bacterial resistance to penicillin and streptomycin is likely to be a major problem in antibiotic therapy. It

is my impression that gram-negative bacteria become more readily resistant to streptomycin than do gram-positive organisms to penicillin. In vitro tests have demonstrated that resistant bacteria appear in sputum cultures of some patients after periods of treatment with penicillin and streptomycin.

In the medical treatment of bronchiectasis it should be borne in mind that therapy is directed against a complication rather than the primary bronchial dilatation. Although aerosol therapy may be effective in reducing the volume of pulmonary secretions in bronchiectasis, recurrence of symptoms is common. With the exception of pulmonary resection, no treatment can cure bronchiectasis.

Routine Chest Roentgenograms of Hospital Admissions*

G. NEWTON SCATCHARD, M.D., and
DIANA OLGA DUSZYNSKI, M.D.

Buffalo, New York

Our interest in obtaining a chest roentgenogram on all admissions to the Meyer Memorial Hospital was stimulated by the fact that we were finding many more early tuberculous infiltrates among our student nurses than the law of averages should allow. We have a rather large tuberculous service in the hospital but this did not seem to be the source of infection. The most logical assumption was that the girls were being infected on the general non-contagion wards by unsuspected tuberculous patients. This impression was strengthened by the work of Farber and Clark.¹ In this paper it was shown that there are many cases of tuberculosis in the hospital wards, who enter for unrelated complaints and may be on the service for long periods without their tuberculous lesions being discovered. Such patients are frequently infectious and we believe, that they are the chief source of tuberculosis among the nursing staff. They are also, of course, a danger to the other patients as well as to the doctors, medical students and other hospital personnel.

The best way to eliminate a large percentage of these unrecognized cases we believe, is to take a chest roentgenogram on every patient admitted to the hospital before they are sent to their room. After studying the various available methods of accomplishing this, it seemed to us that the best solution was to utilize the apparatus making a set of stereoscopic 4 x 5 inch miniature chest radiographs on a 4 x 10 inch film. The standard 14 x 17 inch chest film is too expensive and too difficult to process and handle when a large volume of work is to be done. Thirty-five mm. film was considered. Here the reported accuracy is slightly less than with the method chosen. The films must be magnified and there is the element of eyestrain which becomes important when large numbers are to be studied. This is said to be a rather serious factor with these very small films.

On the basis of this reasoning, we chose the photoroentgen unit, which was installed in a room directly across the corridor from

*From the Department of Roentgenology, Edward J. Meyer Memorial Hospital, and the Department of Surgery, University of Buffalo School of Medicine, Buffalo, New York.

the Admission Department. This room is so arranged that we have the tube set at exactly the right distance from the unit and at the correct angle. The tubestand extends from the floor to the ceiling. It is mounted on a rotating pedestal and not on a track. This permits only rotation of the tubestand which in such a room is a distinct advantage. It eliminates all tracks and rails which are always in the way. It makes centering more accurate. At an angle of 45° from the photoroentgen unit we placed a 14 x 17 inch casset holder so situated that by swinging the tubestand through this small angle to a catch position it is properly centered to make a 6 foot roentgenogram on the standard size film. The tube in this position can also be raised sufficiently to allow us to take a 6 foot film on patients lying on carts. In a general hospital there are several admissions daily who are unable to sit up and such an arrangement is important if these people are to be x-rayed.

With the room so arranged, the technical problems of doing the work are not great. We find that we can do all admission chests as well as the routine hospital chest work in this one room. Special studies are of course done in the regular x-ray Department. The technician who formerly was occupied constantly with chest work in the x-ray Department is now assigned permanently to the photoroentgen room during the day. In order to make the service fairly continuous, we keep this room open until eleven o'clock at night which requires the services of an extra technician. There are very few admissions between eleven P. M. and 8:30 A. M. Those who do come in during these hours are sent to the x-ray room the next day if their condition permits.

As our experience with the photoroentgen method has increased, we have been pleased with the quality of films. We have gradually been able satisfactorily to examine a larger and larger number of patients. We are also able to obtain good lateral and oblique stereoscopic views of the average size patient on the miniature film. In the beginning, all lateral and oblique studies and all large patients were examined on the large films.

The detail shown in the small films is striking. It is such that most inexperienced observers over-read them. Lesions which are small and not particularly dense and easily overlooked on the large films, are usually sharp and clear-cut in the stereoscopic small films.

We have no satisfactory explanation for the remarkable detail shown by this method. It appears however to be the result of a combination of physical factors. In the first place, the penetration as expressed in peak kilovoltage is extremely high. Our chart calls for all exposures to be made between 85 and 100 P.K.V. The second factor is the grid. We have had a stationary fine grid built into

our unit so that it must always be used. This cuts out much of the scatter-ray and increases detail in the same way that the Bucky diaphragm does in the ordinary radiograph. The third factor which appears important is that this is a purely photographic process, using a single emulsion film with different characteristics than the usual x-ray film. Full and complete development of the film by the time, temperature method is also essential.

With these factors operating, the technique is quite critical and demands constant attention. This means that the radiologist in charge must always be on guard for poor quality films so that the cause can be established and corrected immediately. Poor technique renders the examinations worthless. We are convinced that a poor x-ray examination is misleading and worse than none.

In view of the excellent detail and quality of small films, we now rarely require a check on lesions with the large films. We prefer frequent studies with the small stereoscopic pair. Our follow-up studies combined with the laboratory and clinical findings seem to bear out our x-ray conclusions.

Our experience with this type of chest radiograph can best be summarized by means of a chart. The first fact noted is that about 90 per cent of all our chest patients are examined by the small film method only. Practically all types of chest lesions can be satisfactorily studied by this method. It need not be considered as purely a survey instrument, but as an apparatus of great value to the general hospital x-ray department.

The most important figure to be considered is the large number of unsuspected tuberculous lesions discovered by x-ray. This figure includes only cases which are admitted to the hospital or clinic with no suspicion of tuberculosis noted by the clinicians. If there is any suspicion of the tuberculous lesion, it is not included in this group. The uncorrected figure for unsuspected tuberculosis in those patients never before seen in the x-ray department is 3.7 per cent, a figure which is rather high. It is, of course, based purely on the appearance and any lesion suspected of being tuberculous is included. When the figure is corrected by including only those actually proved by finding a positive sputum or by post mortem examinations, it is 1.8 per cent.

In one subdivision of this series (3,000 examinations), 63 cases of unsuspected tuberculosis were discovered in the group of patients never before seen in the x-ray department. Of this 63, only 49 charts were available for study. Review of the 49 cases shows that 10 per cent did not have active tuberculosis. There are 5 such patients, 4 had adequate sputum studies, all negative and the fifth patient was necropsied and had anthracosis plus interstitial pneumonia.

9 cases had positive sputum,
8 cases were proved at necropsy,
5 cases were immediately transferred to the tuberculosis division and there proved.

This is a group of 22 cases or 45 per cent definitely proved as tuberculous.

Another group of 22 cases or 45 per cent were inadequately studied up to the present. This group is composed of patients who absconded, were court cases and those who preferred to return to their private physicians. We have no way of knowing how many of these will ultimately be proved tuberculous but feel that at least 70 or 80 per cent is a conservative figure.

Based on the above figures 1.8 per cent of the new patients never before seen in this x-ray department have actually proved tuberculous. Only a portion of the patients could be properly and adequately studied. In our opinion, at least 2.5 per cent of our new patients have pulmonary tuberculosis. The chart also demonstrates the various types of nontuberculous lesions noted in the group of patients studied. An attempt has been made to show which type of lesion requires the use of larger films to substantiate the diagnosis. It is noted that the distribution is fairly even.

Our greatest problem has been and probably will remain that of deciding what constitutes the minimal changes in the lung parenchyma which may be considered evidence of active tuberculosis. We have been calling every lesion tuberculous which is in any way suspicious. Frequently lesions are seen, which on the first x-ray examination bring up the differential diagnosis of tuberculosis or one of the following: resolving pneumonia; atypical pneumonia; bronchopneumonia; lung abscess; bronchiectasis; bronchogenic carcinoma; occupational fibrosis, etc. When such a problem arises, we note that the appearance suggests one of the above named lesions but that x-ray alone cannot rule out tuberculosis at the present time, which must be done by clinical and laboratory studies. Such patients are handled as though they were tuberculous until a diagnosis has been established. If we are to accomplish our purpose of eliminating tuberculous patients from the general wards this attitude must be maintained. It is a constant source of surprise to us how large a percentage of these questionable cases are eventually proved to be tuberculous.

CONCLUSIONS

If all the general hospitals adopt the principle of making x-ray studies of the chest on every admission and calling every suspicious lesion tuberculous, until proved otherwise, a large number of tuberculous patients will be found. It is a protection against the

X-RAY STUDIES OF THE CHEST

From July 8, 1944 to March 12, 1945

Total Examinations	10,000	Patients with Lesions	4,329
Photoroentgen Examinations ...	9,486	Patients with no Lesions	5,671
Conventional Examinations	766	New Patients (X-ray)	4,671
Combined Method	262	Revisits (X-ray)	5,329
Total Hospital Admissions	5,983	Total New Patients (Hospital) ...	2,245

Lesions Diagnosed by X-ray	X-Ray Exams.	Conven- tional Exams.	New Patients	Revisits	Total
Pulmonary Tbc., Unsuspected	235	9	173	67	240
Pulmonary Tbc., Grade I			115	42	157
Pulmonary Tbc., Grade II			43	16	59
Pulmonary Tbc., Grade III			18	6	24
Pulmonary Tbc., Grade I (total)	604	15	178	436	614
Pulmonary Tbc., Grade II (total)	655	29	100	584	684
Pulmonary Tbc., Grade III (total)	481	24	86	415	501
Tuberculosis, primary	81	18	29	62	91
Mediastinal Lymph Node Tuberculosis	17	4	6	12	18
Basilar Tuberculosis	3	2	2	2	4
Milliary Tuberculosis	5		1	4	5
Tuberculoma	4	1		5	5
Thoracoplasty	103	7	2	108	110
Pneumothorax (Therapeutic and Spontaneous)	324	34	28	316	344
Pleural Effusion (All Types)	396	41	124	297	421
Pulmonary Congestion—Cardiac	244	11	150	102	252
Empyema	72	42	16	74	90
Pleurisy (Plastic)	729	72	252	513	765
Calcified Pleural Plaque	12	2	5	8	13
Pneumonia—Lobar	260	62	143	152	295
Pneumonia—Broncho	48	35	42	40	82
Pneumonia—Atypical	17	4	9	10	19
Atelectasis (Massive and Partial)	7	4	4	5	9
Lung Abscess	10	4	3	9	12
Gangrene of Lung	2	2	1	3	4
Cystic Lung Disease	2	4	1	2	3
Bronchiectasis	24	3	6	20	26
Occupational Fibrosis	22	2	2	22	24
Pulmonary Fibrosis following X-ray Treatment	4	2	4	2	6
Pulmonary Emphysema	488	19	275	230	505

Lesions Diagnosed by X-ray	X-Ray Exams.	Conven- tional Exams.	New Patients	Revisits	Total
Pulmonary Infarcts	5	2	4	2	6
Miliary Leukemic Infiltrates	1		1		1
Bronchogenic Carcinoma	38	32	9	41	50
Neurofibroma	1	2	1	1	2
Benign Lung Tumor	4	4	1	5	6
Metastatic Carcinoma in Lung	10	2	3	8	11
Hodgkin's Disease	1			1	1
Mediastinal Tumor	2	2	1	1	2
Herniation of Mediastinum	3			3	3
Heart Disease—Congenital	2	1		3	3
Heart Disease—Rheumatic	46	5	24	25	49
Heart Disease—Enlarged	867	88	559	384	943
Aortitis	190	19	133	73	206
Aneurysm—Aortic	19	11	10	13	23
Dextrocardia—Congenital	4		2	2	4
Pseudodextrocardia	6	1	4	3	7
Pericarditis	2	2		3	3
Enlarged Thyroid	32	5	22	12	34
Subdiaphragmatic Abscess	1	2		3	3
Diaphragmatic Hernia	1	2	1	1	2
Eventration of the Diaphragm	4		3	1	4
Perforated Viscus	6		6		6
Subcutaneous Emphysema	6	6	5	7	12
Kyphosis and Scoliosis	31	3	17	17	34
Erosion of Vertebrae	1		1		1
Fractures (Ribs and Clavicle)	26	2	20	8	28
Rib Spurs	1		1		1
Fused Ribs	3		3		3
Bone Tumor of Rib	2		1	1	2
Tuberculous Osteomyelitis of Ribs	4	1		4	4
Metastatic Carcinoma in Ribs	9	5	3	10	13
Foreign Body in Dorsal Vertebra	1	1	2		2
Rickets (Ribs)		1	1		1
Cold Abscess (Dorsal Spine)		1	1		1
Extrathoracic Mass	1			1	1
Foreign Bodies in Chest Wall	1		1		1

high tuberculous incidence among the hospital personnel, especially nurses. This is feasible now that a satisfactory method of miniature chest radiography has been developed. The miniature films are sufficiently good that they can also be used for a large percentage of the usual original chest x-ray studies as well as follow up examinations.

It will be a great step forward in the battle against tuberculosis if all general hospitals adopt this method and attitude. The cost of such a program will soon be cancelled by the low cost of film and labor as well as the economic benefit to the community in general.

CONCLUSIONES

Si todos los hospitales generales adoptaran el principio de llevar a cabo estudios radiográficos del tórax de todas las admisiones y de diagnosticar como tuberculosa toda lesión sospechosa hasta que se probara lo contrario, se descubriría un número notable de enfermos tuberculosos. Sería ésta una protección contra la elevada frecuencia de la tuberculosis entre el personal del hospital, especialmente las enfermeras. Esto es factible ahora que se ha desarrollado la técnica satisfactoria de tomar radiografías torácicas en miniatura. Las películas en miniatura son lo suficientemente buenas para que se puedan usar también en un alto porcentaje de los usuales estudios radiográficos torácicos originales y en los exámenes subsiguientes.

Si todos los hospitales generales adoptaran este método y esta actitud, esto sería un paso muy avanzado en la lucha contra la tuberculosis. El costo de este programa se cancelaría pronto por el pequeño costo de las películas y de la labor y por el beneficio económico que acarrearía a la colectividad en general.

Discussion

DONALD McKAY, M.D.

Buffalo, New York

I have, for a long time, had a great interest in case finding methods and I'm proud that this report comes from the same Institution with which I have been associated for many years. The need for this survey work is quite apparent. This need has been strikingly demonstrated, too, by the Induction Centres of the Armed Forces. About 1 per cent of rejectees find their major defect in a pulmonary lesion. Since a large percentage were unknown cases and coming from an age group which, so to speak, might

be considered the cream of the crop, it is easy to visualize the benefits of such a program.

In a fairly large defense industry in which we routinely x-rayed all prospective employees, we found the incidence of pulmonary lesions to coincide closely with that of prospective members of the Armed Forces. In our plant most of the cases were previously unknown. The known case of pulmonary disease usually avoids seeking employment where routine x-ray inspections are a requisite. We have felt the effort to maintain a personnel free of infectious disease was worth the effort. Many having pulmonary lesions were eventually employed, and rightly so, once their lesion was considered apparently cured, arrested or apparently arrested and provided the disease was not too extensive for a good light-work-risk. In Buffalo we recently surveyed a group of 12 small industries, taking 1254 films. These results bear out the assumption that the known tuberculous patient tends to avoid plants where pre-placement films are a rule. And, of course, such a survey indicates the value of a health program from both the standpoint of management and employees.

These analogies are noted for comparison with routine hospital admissions. But are they analogous? Those examined for the Armed Forces or applying for an industrial position are for the greater part a selected group while persons applying for hospital admission are ill. Should we not expect a greater percentage to show pulmonary changes? The admissions to the Meyer Memorial Hospital or to any other large municipal hospital come mostly from the low income group of citizens and therefore are liable to show more pulmonary lesions on such a survey, since tuberculosis still finds its greatest number of victims among individuals on low economic levels where poor dietary habits, lax hygienic practices and unsuitable housing conditions prevail. However, there is already evidence to show that the admissions of an ordinary General or Private Hospital are apt to present a greater than expected percentage of pulmonary lesions. It is well known that tuberculosis may be ushered in by gastrointestinal complaints. Some of these pass through abdominal diagnostic procedures before the diagnosis is recognized. Some tuberculosis is ushered in by laryngeal complaints and these too have a local investigation or even extirpation of the tonsils before a correct appraisal is obtained. Cases of ischio-rectal abscess may have a tuberculous etiology, with pulmonary findings of varying intensity. These may serve as examples of patients having symptoms and signs remote from the original disease focus. If such a hospital maintains a Neuropsychiatric Service, a greater than normal rate of tuberculosis complications may be expected.

So if routine chest surveys are a valuable procedure for the Armed Forces and Industry, it would appear that they should be still more valuable in general hospital practice. Considering our experience at the Meyer Memorial Hospital, we are strongly convinced of the need for this service if only for the protection of the Hospital and University Personnel. For years I found the Mantoux reactors among nurses classes rise from 20 to 30 per cent on admission to Training School 50 and 60 per cent at the end of the first year of training, in spite of the fact that no student nurses were assigned to the Tuberculosis Service until at least one year's training had elapsed. Delayed diagnosis of tuberculosis were being constantly made in all other services. In the interim, these patients were a constant hazard to their attendants who treated and cared for presumably pneumonias, laryngitis, gastro-intestinal disorders, ischio-rectal abscesses, dementias, etc. The problem is less in a general or private hospital only to a degree already indicated but the problem is still present and worthy of solution. Initial cost charges, maintenance and increase in personnel needed could be met by a small fixed fee such as already used in hospital practice. For value received I think the patient body would get a great deal more than it derives from some other common routine procedures and certainly the information received by the Medical and Surgical Staff would be most useful, and the protection of the attendants against otherwise unrecognized cases of tuberculosis would be of great value.

It is gratifying to note that Dr. Scatchard does not attempt to evaluate all his suspicious cases. This procedure calls for the observation of the attending physician, various laboratory procedures such as direct sputum smears, cultures, guinea pig inoculations, sedimentation rates, differential blood counts, the efforts of the bronchoscopist and often the skill of the thoracic surgeon. True a large percentage of pulmonary lesions noted may be non-infectious or well healed but in our modern concept of tuberculosis all cases should be as correctly appraised as possible and advised adequate observation and treatment.

The chart indicates the great value of the routine x-ray examinations in the diagnosis of various other pulmonary lesions, such as the pneumonias, bronchogenic carcinoma, lung abscess, etc., all of which at times may present symptoms and signs not apparently related to the respiratory system. The early discovery of disease conditions in the lung by the use of the routine survey may save much precious diagnostic time and save for surgical procedures many cases which might otherwise have drifted into the inoperable group.

The Surgical Treatment of Bronchial Adenoma*

ALFRED GOLDMAN, M.D., F.C.C.P.**

Beverly Hills, California

A concept that is bronchial adenoma, its growth potential, natural life history, histopathology, separation from carcinoma, and differentiation from other polypoid tumors has been described in previously published papers.¹⁻⁵ Part of the controversy in this subject was beautifully expressed by Brunn at our tumor conference March 10, 1941. "Not so much was known about adenoma until recently, we do not know the full natural history of this disease even now. There is some dispute first as to malignancy. Some people think they are malignant, we think they are not. In some cases we have left some tumor in, and two years have elapsed but nothing has happened to them. We think there are varieties that are malignant so that you have to be very careful what you say about these things, and be very careful of accepting other men's opinions because they may be dealing with another type tumor. The whole subject is a little obscure and a whole lot has yet to be learned."

Although published reports⁶⁻¹⁰ containing isolated instances of regional or distant metastases had been made, we had not observed any such metastases in our cases. We fully expected, however, that sooner or later metastases would appear but to date they have not. Other authors have indicated that bronchial adenoma metastasizes to the regional lymph nodes. Chamberlain¹¹ found metastases in fifty per cent of ten specimens examined; six of these were surgically removed by lobectomy and one by pneumonectomy. Graham¹² has repeatedly stressed the potential malignant qualities of bronchial adenoma (mixed tumor). He, Anderson,¹³ Clerf,¹⁴ and Bigger¹⁵ reported metastases and malignant degeneration. Crafoord¹⁰ indicated that adenomata are a complex group: (1) clinically and histologically benign, (2) clinically benign but histologically malignant. He, like Graham, relates the behavior of bronchial adenomata to that of mixed tumors of the salivary glands.

The opinions as to benignancy or malignancy of bronchial adenoma are due in the main to a failure to agree upon a basic

*Presented at the Twelfth Annual Meeting, American College of Chest Physicians, San Francisco, California, June 30, 1946.

**From the Department of Surgery, Division of Thoracic Surgery, University of California Medical School and the San Francisco Hospital. Other operators of these patients were Harold Brunn, H. B. Stephens, A. L. Brown, and Clayton Lyon.

histological diagnosis. Maier¹⁶ has separated twenty-five to thirty cases of so-called adenomas reported in the literature which arise either close to the carina or in the tracheal wall. In these, there has been a somewhat higher incidence of malignant characteristics than among other adenomas. Histologically, the glandular formation is somewhat more striking than in most other adenomas. He believes Anderson's¹³ case of metastases to the liver is one of these variations. The mortality rate has been much higher in this variety than in ordinary adenoma because patients die from tracheal obstruction. We have observed a cylindroma arising in the right stem bronchus which infiltrated the wall of the trachea and, in five years after bronchoscopic diagnosis, produced death due to tracheal obstruction. Beyond doubt, several reported mixed tumors do not fit the histological descriptions laid down for adenoma. Tendency not to separate cylindroma would give to adenoma an increased invasiveness found in the former tumors but not present in our adenomas. Other types of malignant tumors may simulate adenoma because of their occasional long duration, i.e., epidermoid carcinoma,¹⁷ adenocarcinoma,¹⁸ leiomyosarcoma,³ and lymphangi endothelial sarcoma.³ Some of these have had long clinical histories but their histology is so distinct as to separate them from adenoma. Small cell carcinoma¹⁹ may simulate adenoma in the bronchoscopic biopsy but their duration is usually very short and like the above-mentioned tumors they metastasize distantly. We believe that with the rigid adherence to the histological criteria set forth by Jackson,²⁰ Wessler,²¹ and others^{3,5,22,23} for the diagnosis of adenoma the number of patients exhibiting metastases will be materially decreased. Furthermore, the pressure necrosis and local infiltration together with the appearance of multinucleated cells, "Durchwanderung" into the capsule and contiguous extension to one mediastinal lymph node are not evidences of increased rate of growth nor should these findings designate the tumor as undergoing malignant degeneration. These latter findings are apt to occur in tumors older than 15 years.

We believe that bronchial adenoma should be regarded as a very slow growing epithelial tumor which is locally invasive, clinically benign, but apparently capable in rare instances of becoming malignant. Due to its location, it usually produces serious disabling symptoms of suppuration if not death. Total removal of the tumor together with removal of the distal suppurating lung is the ideal treatment. To accomplish this pulmonary resection is the treatment of choice in approximately ninety per cent of the patients. In the absence of suppuration bronchotomy may be indicated. Resection accomplishes both the complete removal of the tumor and the suppurating lung. Unlike carcinoma, lobectomy

rather than pneumonectomy is sufficient if it includes all the tumor and the suppurating lung. Mediastinal lymph node dissection is rarely necessary. Preoperative preparation consisting of penicillin, sulfamerazine, transfusion, rest, high caloric, high vitamin diet, and release of bronchial obstruction by endoscopic therapy, is important to keep the operative mortality low. Operation should not be performed during an exacerbation of the pulmonary infection or immediately after a large hemoptysis. Several weeks or months may be utilized to raise the patient's preoperative condition to the optimum.

In general, the technique of lobectomy for bronchiectasis with hilar ligation of vessels and primary ligation and suture of the bronchial stump is the method of choice. Certain peculiarities of these tumors must be considered, namely, the enlargement of the bronchus due to the tumor within it, the location close to the stem bronchi, the tendency for the tumors to project towards the trachea, and the adhesive pleuritis associated with a long-standing infection. The enlargement of the bronchus disturbs the relation of the vessels so that they must be dissected out with great care at the hilum. The position of the tumors makes it necessary to amputate the lobe close to the stem bronchus. However, at times the incision in the bronchus may be made below the tip of the endobronchial tumor so that a slightly longer bronchial stump is obtained. The adhesive pleuritis frequently involves the pericardium and the adhesions may contain fairly large blood vessels. These adhesions should be ligated when they are cut.

Pulmonary resection is indicated in approximately 90 per cent of patients in order to remove all the tumor and suppurating distal lung. As stated by Chamberlain¹¹ and Adams,²⁴ pulmonary resection is preferable to bronchoscopic removal because bronchoscopic removal can only safely remove all the tumor in the relatively rare instance where the pedicle is small, the tumor easily accessible and wholly contained within the bronchus.

Bronchoscopy is indicated in all cases, to define the location of the tumor and to obtain a biopsy. Further bronchoscopic removal is indicated to re-establish the aeration of the distal obstructed lung in preparation for pulmonary resection, in those tumors which involve the trachea, and as a definitive treatment in patients over the age of 60 or in those who are poor surgical risks. In some patients it will be very difficult to determine and it may take several years to discover evidence that all the tumor has not been removed and that endomural or extrabronchial portions remain. When this occurs, the bronchial mucosa will have grown over the stump covering the endomural portion which is seen as a flat elevation covered with spidery blood vessels. Both hem-

orrhage and recurrent pulmonary suppuration may continue. Biopsies from such an area will usually show only fibrous tissue. (Case 10, Fig. 2).

Pulmonary resection is apt to be extremely difficult and give an increased surgical mortality in those patients in whom bronchial obstruction and distal suppuration in an entire lung has persisted for more than 15 years, because resection through dense pleural symphysis, accompanying lymph node hyperplasia at the hilum, and increased collateral circulation aid and abet the hazard of operation. Continued loss of proteins and lowered cardio-respiratory reserve also add to the surgical risk. Therefore we have not urged pulmonary resection in that group of patients in whom bronchoscopic removal appears impossible but who probably possess carnified lung with suppuration. They usually have had surgical drainage of empyema and pulmonary abscess, which has contributed to the intensity of the pleural symphysis. We have several such patients with more than 10 years duration since bronchoscopy who are able to work at sedentary occupations and have shown no signs of malignant degeneration. It is our opinion that early lobectomy would have been the best treatment, but they were discovered too late in their clinical course. In addition to their pulmonary suppuration, they also had large doses of x-ray therapy, another factor adding to the surgical risk.

It is the purpose of this paper to present ten consecutive cases

FIGURE I—DURATION OF ADENOMA TREATED WITH PULMONARY RESECTION

Case	Years since pulmonary resection	Years since bronchoscopic biopsy	Years since onset of symptoms	Type of Resection
1. J.Gh.	1/12	2/12	1½	L. Pneumonectomy*
2. H.L.	7½	15	21	L. Pneumonectomy
3. F.J.	7½	7½	14	L. Lower Lobectomy
4. C.R.	7½	7½	10	L. Pneumonectomy
5. G.D.	6½	7½	17	L. Lower Lobectomy
6. E.A.	5	5	15½	R. Middle Lobectomy
7. J.G.	6½	7	7½	R. Upper Lobectomy
8. I.S.	4	4½	5	L. Pneumonectomy
9. D.M.	4	4	5½	R. Lower and Middle Lobectomy
10. A.B.	3/12	7	34	L. Lower Lobectomy Bronchotomy

*Only death.

of bronchial adenoma treated with pulmonary resection which have been followed up one hundred per cent (Fig. 1). The duration since operation is twenty-four days (this case being the only surgical mortality), seven and one-half years, seven and one-half years, seven and one-half years, six and one-half years, five years, seven years, four years, four years, and three months respectively. In no case has any metastasis occurred, although tumor was left in the bronchial stump for seven and one-half years in two cases and for four years in one case. This long duration and benign behavior of tumor left in the bronchial stump unquestionably demonstrates the low growth potential of these tumors. It is probable that we shall see evidence of recurrences of these residual tumors, but to date none has occurred. Because of this low growth potential, we feel that it is worth while to conserve functioning pulmonary tissue wherever possible and to this end, in the tenth case, a technique conserving the upper lobe was utilized by combining lower lobectomy with bronchotomy. This case will be described in detail (Case 10, Fig. 3).

Case 1: L.Gh., white male, aged 24 years, had his onset of illness in 1936 with cough and frequent chest colds. In February 1937, the patient was treated for pneumonia. After six weeks, he recovered sufficiently to return to his occupation as a mechanic. The x-ray films of his chest revealed, however, that a complete clearing of the left lung never occurred. The patient had a recurrence of symptoms in January 1938. X-ray films at this time revealed a shadow in the left hilus. The density in the left lung increased, atelectasis of the left lung became pronounced, and bronchoscopy was performed on January 31, 1938. A polypoid tumor was visualized in the left main bronchus, just proximal to the upper lobe opening. The tumor almost completely filled the lumen of the left main bronchus, and was not particularly vascular. The biopsy material was diagnosed epithelioma by Dr. G. Y. Rusk.

He entered the San Francisco Hospital on February 15, 1938. Examination showed him to be acutely ill, with evidence of recent weight loss. His disease ran a septic course in the hospital in spite of bronchoscopic drainage of the left lung and a pneumonectomy was elected, because the consensus was that we were dealing with a malignant tumor. The patient's poor condition was recognized but we felt we could not improve it because of his failure to respond to treatment. A left pneumonectomy was performed on February 25, 1938, through a posterior lateral incision. The operation was accomplished with difficulty because of adhesions between the upper lobe and the parietal pleura. The hilar structures were closed by several mass ligatures of heavy silk.

Postoperative course was satisfactory for 14 days and then the operative wound broke down because of infection. The bronchial stump opened up and a streptococcus empyema developed. The patient expired on the 24th postoperative day. Necropsy was refused.

Examination of the operative specimen revealed a polypoid tumor completely filling the left main bronchus and extending posteriorly through the bronchial wall and overlying a pulmonary vein but not

involving the latter. No metastases were present in the regional lymph nodes removed. The upper and lower lobes were atelectatic and showed various stages of pneumonitis; they were not invaded by tumor. Histological diagnosis was changed to bronchial adenoma.

Discussion: If the correct diagnosis of adenoma were made preoperatively, we would have made a more serious attempt to remove the endobronchial portion of the tumor bronchoscopically. We could have re-established bronchial drainage by this procedure, relieve infection and thus render the patient a much better surgical risk. Also, the use of penicillin both parenterally and intrapleurally, together with sulfamerazine might have prevented the postoperative infection from which he succumbed. Pre- and postoperative administration of these antibacterial agents are routine today. This is the only surgical or other mortality in this series of ten pulmonary resections.

Case 2: H. L., a white female, 48 years of age, was seen at the University of California Thoracic Surgery Clinic in May 1931. At that time, she had a productive cough, night sweats, pleurisy, weakness and fatigue, of six years' duration. X-ray examination on May 19, 1931, showed a dense, sharply outlined, nodular shadow in the upper half of the left hilum. Bronchoscopy on May 25, 1931, showed a large white papillomatous mass with a mulberry-like surface, three centimeters from the carina, projecting into the left stem bronchus from the mouth of the upper lobe. Biopsy was interpreted as a histologically malignant tumor. Several subsequent attempts at bronchoscopic removal were made during the next 18 months. As hemangioendothelioma was the most favored diagnosis, x-ray therapy was given. In December 1932, x-ray examination showed no decrease in size of the shadow. In August 1938, the entire left upper lobe had become atelectatic, and there were old fractures of the sixth, seventh, and eighth ribs over the upper lobe. Bronchoscopy showed the tumor in the stem bronchus still unchanged. Now the histological diagnosis was carcinoma.

There was much discussion as to this diagnosis. The age, now 55, the spontaneously fractured ribs, recent weight loss and the histology all militated against a benign tumor, in spite of a duration of more than seven years since the first bronchoscopic diagnosis. Pneumonectomy was performed in one stage on September 1, 1938, with individual ligation of vessels, section of the stem bronchus above the tumor, closure of this bronchus by ligation reinforced with interrupted silk sutures, and partial removal of the mediastinal lymph nodes. On exposure, the lung was densely adherent to the second, third and fourth ribs. The tumor palpated near the hilum was thought to be malignant and invading these ribs, so they were resected with the lung.

The resected left lung showed the endo-extra-bronchial tumor to be 5 cm. in its longest diameter, completely encapsulated without extension to the ribs or the mediastinal lymph nodes. The left upper lobe was atelectatic. The lower lobe was not involved. Histologic examination of the material removed at pneumonectomy, together with a review of specimens removed at the previous biopsies, proved the tumor to be an *adenoma*. The fractured ribs contained no tumor.

Postoperative course was satisfactory and she was discharged on the 30th postoperative day. A small sinus in the wound healed up after 3 months.

Follow-up: She is now 63 years of age, able to do housework, seven and one-half years after pneumonectomy, 15 years after bronchoscopic biopsy and 21 years after onset of symptoms.

Case 3: F. J., a white female, 26 years of age, was admitted to the San Francisco Hospital on August 21, 1938. Her illness began in 1932 with wheezing and "asthma," followed by pulmonary hemorrhages, sudden in onset and termination, often occurring with the menses. During the next six years the hemorrhages were replaced by febrile periods terminating with the expectoration of bloody, fetid sputum. The latter became more frequent until they were occurring every three weeks at the time of her admission to the hospital.

X-ray examinations showed cystic whorls behind the left border of the heart. These shadows varied in appearance from time to time. Repeated examinations of the sputum failed to reveal tubercle bacilli.

The clinical diagnosis was tuberculosis of the lungs. The patient had been treated by several physicians and bronchoscopic and bronchographic examinations had been performed without demonstrating the pathological changes.

Bronchoscopy, done at the San Francisco Hospital in August 1938, showed a small polypoid tumor obstructing the mediastinal branch of the left lower lobe. Biopsy proved this tumor to be an adenoma. Endobronchial probing with serial selective bronchography showed bronchiectasis limited to the mediastinal segment of the left lower lobe.

A one-stage lobectomy was performed on October 10, 1938. The patient's convalescence was uncomplicated. The portion of the tumor left in the stump was not visible through the bronchoscope one month after operation. The extrabronchial portion of the tumor was 2.5 cm. in diameter and extended posteriorly into the mediastinum. Two lymph nodes examined showed no metastasis. The surgical specimen showed cystic bronchiectasis with a normal apical segment. The bronchiectasis was confined to the segments obstructed by the tumor. The patient was discharged on the 16th postoperative day.

Follow-up: This woman is working and well at the age of 35, seven and one-half years after lobectomy and bronchoscopic biopsy, and 14 years after onset of symptoms.

Case 4: C. R., white male, aged 48 years. The onset of symptoms was in 1936, at which time the patient was treated for lobar pneumonia in the left lower lobe. After recovering from this illness, the patient suffered from repeated attacks of pain in the left chest, elevation of temperature, hemoptysis and dyspnea. He was first seen at the University of California Hospital on September 9, 1938. The x-ray films of the lungs revealed a faint shadow just to the left of the left border of the apex of the heart, and on the lateral film showed a definite consolidation posteriorly in the left lower lobe.

Bronchoscopy was performed on September 9, 1936, and at this time a pale pink, vascular, soft polypoid tumor was seen obstructing the left stem bronchus, above the upper lobe opening. The biopsy material was diagnosed adenoma of the lung, although some favored the diagnosis of carcinoma. On September 12, 1938, the "remaining portion" of the endobronchial part of the tumor was removed through the bronchoscope. Hemoptysis continued, and bronchoscopic examination in November 1938, indicated recurrence of the endobronchial tumor; so a one-stage

pneumonectomy was elected. The operation was performed on December 12, 1938. A posterior lateral approach was used; the entire left lung was densely adherent to the parietal pleura. Mobilization of the left lung was accomplished with difficulty, and the lung had to be removed by the tourniquet method. A careful hilar dissection was impossible. Examination of the surgical specimen showed that all the tumor had not been removed. An advanced degree of chronic suppuration was present in the lower lobe. The patient's postoperative convalescence was complicated by an empyema which was treated by aspiration, tube drainage, and later by Eloesser flap.

Follow-up: At the age of 54 this man is doing light work, still has a small amount of drainage from his Eloesser flap seven and one-half years after pneumonectomy and bronchoscopic biopsy, and 10 years after onset of symptoms.

Case 5: G. D., white female, aged 43 years, admitted to the University of California Hospital on May 22, 1939. The onset of symptoms was in 1929 with non-productive cough and wheezing, followed by a series of "chest colds." One year later, the first hemoptysis occurred consisting of a tablespoonful of blood twice in one week. The diagnosis of pulmonary tuberculosis was made, and the patient was sent to a sanatorium for the next two years, although the sputum was negative for tubercle bacilli. During the years 1933, 1934 and 1935, the patient was fairly well except for cough and clear sputum.

Pulmonary hemorrhages became the cardinal symptom in 1936. These occurred regularly at monthly intervals 5 to 10 days before each period; usually one cup in amount; sudden in onset; bright red; appeared without warning; and continued for the next two years. They stopped for the following nine months and then recurred more copiously than before, now with dyspnea and wheezing.

X-ray films of the chest over seven and one-half years show little change of atelectasis of the left lower lung.

Bronchoscopy in March 1939, ten years after the onset of symptoms, showed a polypoid tumor in the left stem bronchus at the level of the left lower lobe, completely filling it. Biopsy specimen was diagnosed bronchial adenoma, very vascular. In May 1939, the adenoma was partially removed through the bronchoscope. After several attempts at removal, the endobronchial portion of the adenoma was still visible. Serious hemorrhage discouraged continued bronchoscopic removal. Therefore, on January 12, 1940, a left lower lobectomy was performed with individual ligation and suture of the bronchus. The tumor lay in a cyst-like dilatation of the lower lobe bronchus and its dimensions were 4 by 3 by 3 centimeters, certainly too large to be removed bronchoscopically. Histological diagnosis was adenoma.

The postoperative course was satisfactory and the patient was discharged on the sixth postoperative day. Atelectasis of the left upper lobe and fluid required aspirations.

Follow-up: This woman, now 50 years of age, is able to do her house work six and one-half years after lobectomy, seven and one-half years after bronchoscopic biopsy and 17 years after onset of symptoms.

Case 6: E. A., this 26-year-old woman entered the University of California Hospital on December 31, 1940, with an onset of symptoms of weakness, fatigue, cough, sputum and hemoptysis beginning in 1931.

On arrival via ambulance, she weighed less than 100 pounds and was weakened from severe pulmonary hemorrhage. On January 3, 1941, bronchoscopy with biopsy demonstrated a bronchial adenoma projecting from the right middle lobe opening into the stem bronchus. Tomography demonstrated a large mass in the right middle lobe. The tumor was judged correctly to be too large for bronchoscopic removal.

On February 26, 1941, right middle lobectomy was performed. Hemostasis and isolation of hilar structures were difficult owing to the distorted anatomy and dense adhesions. Mass ligation of the right middle lobe hilum was done and the lobe amputated. Several sutures were placed about the stump for closure and hemostasis, distal to the ligation.

Postoperative course was complicated by bronchial fistula and empyema, which was treated by Eloesser flap drainage.

The right middle lobe was the size of an orange, completely atelectatic and contained in a dilated bronchus a large, encapsulated, lobulated adenoma measuring 6 by 3 by 3 centimeters.

Follow-up: At the age of 32 she is able to work, five years after lobectomy and bronchoscopic diagnosis, and fifteen and one-half years after onset of symptoms.

Case 7: J. C., a white female, aged 21 years, entered the University of California Hospital for bronchoscopy July 13, 1939. Onset of symptoms only six months before, with hemoptysis. A purplish, bosselated tumor was seen in the right stem bronchus, and biopsy showed it to be adenoma. Several attempts to remove the tumor bronchoscopically failed because of severe hemorrhage. The tumor was not only too vascular but also too large for bronchoscopic removal.

On April 10, 1940, lobectomy was done. Postoperative course was complicated by empyema, treated by Eloesser flap drainage. Some pathologists reported this tumor as probably malignant. Our diagnosis was adenoma. The extrabronchial mass was 3 centimeters in diameter and made pressure upon the middle and lower lobe bronchi from the mediastinal side. Some multinucleated cells were present.

Follow-up: This woman is now 28 years of age and is well, six and one-half years after lobectomy, seven years after bronchoscopic biopsy diagnosis and seven and one-half years after onset of symptoms.

Case 8: I. S., This white female, aged 29 years, entered the University of California Hospital on April 1, 1942. Onset of symptoms was November 1941, with severe chest cold, wheeze and bloody sputum. Bronchoscopy in March 1942, in an outside hospital disclosed a polypoid tumor in the left main stem bronchus and biopsy specimen was diagnosed epidermoid carcinoma. She entered the hospital for interruption of a six-months' pregnancy. A supravaginal hysterectomy was done.

On April 27, 1942, a left pneumonectomy was done through a posterolateral incision with individual vessel ligation, closure of the left stem bronchus above the tumor by ligation and distal suture. Postoperative course was satisfactory and she was discharged on the fifteenth postoperative day.

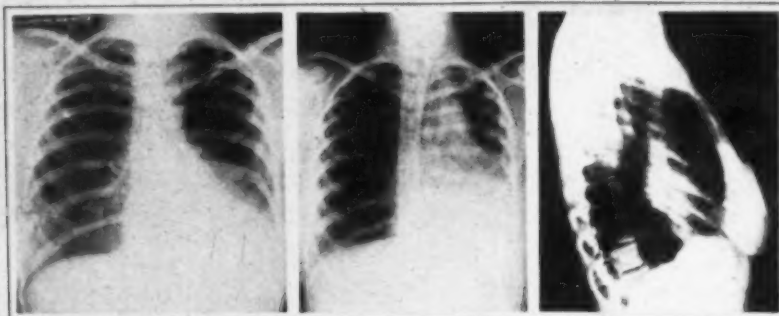
The surgical specimen showed a pedunculated adenoma 1 by $\frac{3}{4}$ by $\frac{3}{4}$ centimeter in the left main bronchus, covered by squamous metaplasia. There was a small amount of infiltration below the mucosa.

Follow-up: This woman is well at the age of 33 years, four years after

pneumonectomy, four and one-half years after bronchoscopic biopsy diagnosis and five years after onset of symptoms.

Case 9: D. M., a white female, aged 41 years, entered the University of California Hospital on April 17, 1942. Her husband, a prominent ear, nose and throat specialist, suggested her bronchoscopic examination. Onset of symptoms was in December 1941, with pneumonia and right pleurisy. Hemoptysis, colds and cough were present. Bronchoscopy on April 16, 1942, showed a polypoid tumor in the right stem bronchus at the level of the middle lobe; histologic diagnosis of the biopsy specimen was adenoma.

Lobectomy was performed on April 29, 1942, with removal of the right middle and lower lobes. Dissection of the middle lobe was extremely difficult due to the adhesions about the hilum and absence of fissures. After dissection had proceeded for approximately four hours, the lower and middle lobes were ligated separately with heavy braided silk and both lobes amputated. Some tumor was present at the point of ligation.



January 28, 1935
Postero-anterior

April 26, 1939
Postero-anterior

April 26, 1939
Left lateral

X-ray films showing increased atelectasis during four years. The tumor is not visualized.



May 10, 1939

Lipiodol instillation showing cystic bronchiectasis of left lung.



April 3, 1940

Bronchoscopic biopsy one year after bronchoscopic removal. No adenoma seen. Inflammatory connective tissue.

Figure 2 (Case 10)

Postoperative course was satisfactory. Thoracentesis was required to remove fluid on three occasions. She was discharged on the 27th post-operative day.

The right middle lobe was markedly shrunken, measuring only 8 by 3 by 3 centimeters. The specimen contained only a small portion of intramural tumor. The right lower lobe contained bronchiectasis.

Follow-up: This woman is well and able to climb the Sierras four years after bronchoscopic biopsy diagnosis and right lower and middle lobectomy, and five and one-half years after onset of symptoms.

Case 10: A. B., a white female, aged 31 years. The time of the onset of symptoms in this patient is difficult to determine. She was a delicate child, weighing but four pounds at birth, and only 40 pounds at the age of 11. At the age of 4, she was severely ill from "whooping cough." At the ages of 10, 12, 15, 17 and 19, she had severe "pneumonias" associated with marked dyspnea, requiring bed rest for several weeks at a time. In 1929, at the age of 22, following another pulmonary infection, the first hemoptysis appeared. The hemorrhages were small in amount, and continuous throughout most of that year. During 1931, several "bad

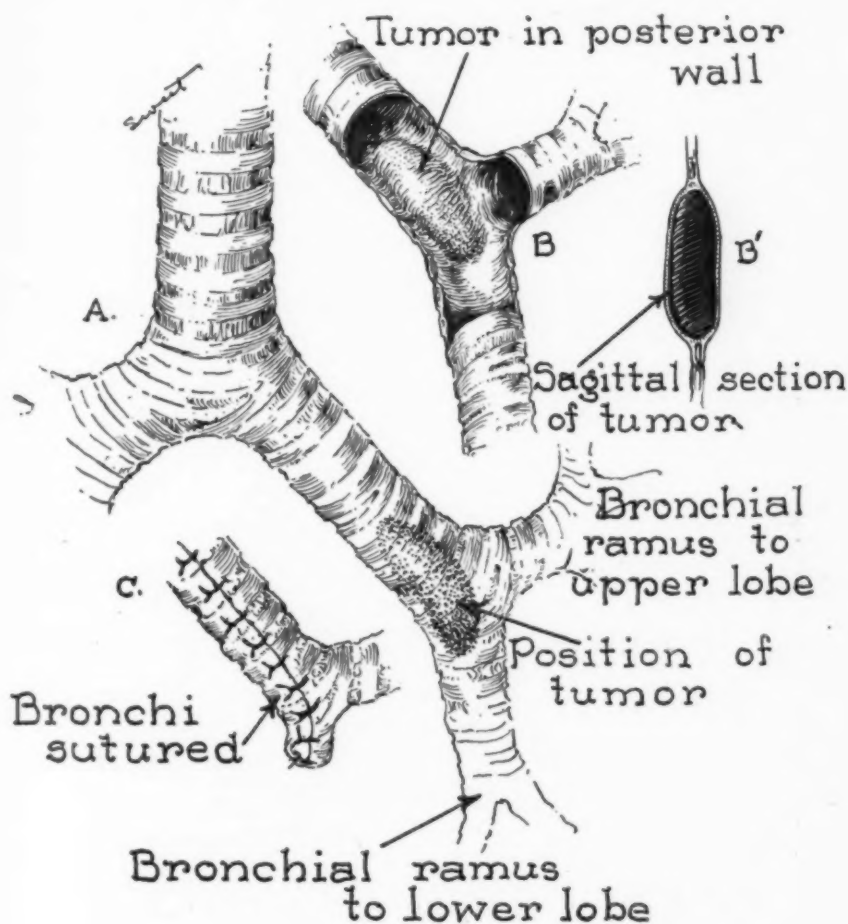


Figure 3 (Case 10)

colds" occurred and wheezing was marked. Hemoptysis increased in amount to 2 to 3 tablespoonsful of bright blood. In 1932, an x-ray film of the lungs was reported negative, although atelectasis of the left lower lobe was present. During the next three years, frequent "bad colds" with fever, and hemoptysis continued, but her general condition remained good enough for her to work as a telephone operator.

In 1935, an x-ray film (Case 10, Fig. 2) of the chest was diagnosed pleurisy with effusion, and she was sent to a tuberculosis sanatorium for six months. The sputum was negative for tubercle bacilli. During the next four years hemorrhages continued, but none were severe. The pulmonary infections required hospitalization on two occasions during this period. Bronchography after bronchoscopic removal disclosed cystic bronchiectasis in the left lung (Fig. 2) and no gross bronchial obstruction.

Bronchoscopy was performed on March 10, 1939. A lobulated, pink, vascular polypoid tumor completely obstructing the left stem bronchus was seen. Approximately one-half of the tumor was removed through the bronchoscope at this time, and the remainder of the endobronchial portion was removed two weeks later. The pathological diagnosis was bronchial adenoma. Some peripheral sections were composed chiefly of vascular spaces suggesting angioma, but the deep sections showed the typical patterns of adenoma.

Since the bronchoscopic removal of the adenoma, she had carried on her job without losing time because of respiratory illness, in spite of destruction of the left lung by bronchiectasis. The sputum (1 or 2 ounces daily) continued, but the left bronchus was patent. Frequent bronchoscopic examinations failed to demonstrate residual tumor (Case 10, Fig. 2) for seven years, but during 1945 she had two attacks of pneumonia and pinkish sputum recurred. Bronchoscopy in January 1946, showed a plaque



Figure 4

Fig. 4 (Case 10): March 21, 1946, 13 days postoperative, showing expansion of the left upper lobe following left lower lobectomy and bronchotomy. Note that mediastinal displacement is approximately the same as April 26, 1939 (Fig. 2).—



Figure 5

Fig. 5 (Case 10): Amputated left lower lobe showing cystic bronchiectasis and point of incision of the lobar bronchus. No tumor present.

of mucosa elevated approximately 2 millimeters and 2 centimeters long on the left stem bronchus just above the left stem bifurcation. Its surface contained several spidery blood vessels.

Pulmonary resection was performed on March 8, 1946, after mobilizing the left lower lobe, through a posterolateral incision under curare, oxygen and nitrous oxide anesthesia. The extrabronchial residual tumor could be seen projecting into the posterior mediastinum from the posterior wall of the left stem bronchus (Fig. 3, A.B.). The entire lung was encased in dense adhesions. It was decided to conserve the left upper lobe by doing a left lower lobectomy and a bronchotomy. Accordingly, the left lower lobe pulmonary artery was ligated with heavy silk and divided. The pulmonary veins were isolated and divided. The lower lobe was amputated and the proximal lower lobe bronchus was held wide open



Figure 6 (Case 10): Endomural tumor, bronchotomy specimen. Note the cartilages with tumor above and below giving a dumb-bell shape to this residual tumor recurring 7 years after "complete" bronchoscopic removal.

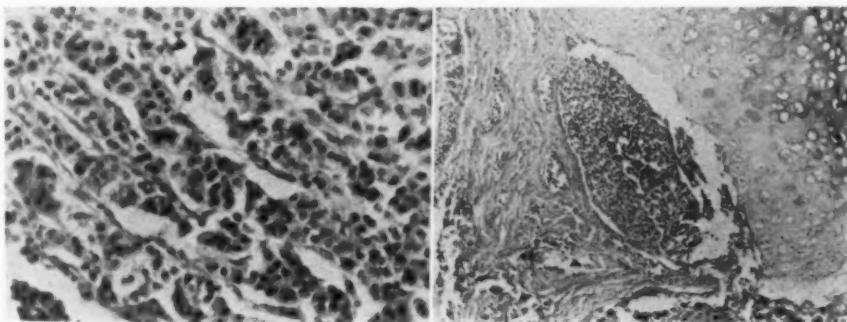


Figure 7

Figure 8

Fig. 7 (Case 10): Microscopic section X500 showing typical bronchial adenoma pattern. Several multinucleated cells are visible and the size and shape of the cells vary somewhat. While these give the appearance of malignancy, the tumor has run a benign course probably of 34 years duration.—Fig. 8 (Case 10): Another microscopic section from bronchotomy specimen X120, showing pressure necrosis of bronchial cartilage by locally infiltrating bronchial adenoma.

to visualize the endobronchial tumor in the left stem bronchus. The posterior bronchial wall was then incised in a "U" shape so as to include the entire residual tumor together with a full thickness of surrounding bronchial wall. The stem bronchus was then closed with a single layer of through and through interrupted No. 60 cotton sutures (Fig. 3-C). Two lymph masses in the hilum of the lower lobe and two nearby mediastinal lymph nodes were removed. Postoperative course was satisfactory and the patient was discharged on the fourteenth postoperative day. X-ray the day before discharge showed expanded left upper lobe. (Fig. 4).

The surgical specimens consisted of the amputated left lower lobe (Fig. 5) and the endomural tumor (Fig. 6). The left lower lobe contained cystic bronchiectasis throughout and no tumor. The endomural tumor was approximately 2.5 centimeters long and 1 centimeter wide and was removed by open bronchotomy. Histological examination (Fig. 7) showed typical adenoma pattern and rather frequent multinucleated cells, as well as variation in size and shape. Necrosis of cartilage (Fig. 8) was also seen.

Follow-up: This woman, now 38 years of age, is well, three months after left lower lobectomy and bronchotomy, seven years after bronchoscopic removal and 34 years after onset of symptoms.

SUMMARY AND CONCLUSIONS

1. Although bronchial adenomata as reported in the literature may be a potentially or actually malignant tumor, our observations indicate that clinically it is benign if treated as a locally invasive, very slow growing, epithelial tumor.

2. Bronchoscopic removal is of value in preparing the patient for pulmonary resection but is not a definitive treatment because it fails to remove the entire tumor in at least 90 per cent of the cases.

3. Late recurrences (after 5 to 10 years) are to be expected following bronchoscopic removal. Failure to recognize and remove such recurrences may lead to progressive destruction of an entire lung.

4. After two or three attempts at bronchoscopic removal, if the patency of the bronchus is not re-established, or if severe hemorrhage occurs, this treatment should be abandoned in favor of pulmonary resection.

- *5. Ten cases of pulmonary resection are reported with a cure rate of 90 per cent and one surgical death from infection. This death, the first case operated upon, might have been prevented with the prophylactic use of sulfamerazine and penicillin.

6. A technique is described for conservation of the upper lobe applicable to adenomata located in a stem bronchus, and accomplished by combining lobectomy with bronchotomy.

*Since this was written two additional cases have been successfully operated upon by the author. In one a metastasis was present in a removed hilar lymph node.

7. Pulmonary resection accomplished a satisfactory result in nine cases and was superior to bronchoscopic removal in treatment of:

- (a) bronchoscopically inaccessible and large tumors,
- (b) recurrent tumors following bronchoscopic removal,
- (c) distal pulmonary suppuration,
- (d) involved mediastinal lymph nodes.

8. No metastases have occurred in any of these ten patients, although in three, tumor was left in the pulmonary stump without apparent spread.

9. With modern pre- and postoperative care, intratracheal anesthesia, and surgical technique, pulmonary resection should be urged for the treatment of benign tumors of the lung, especially in view of their low morbidity, good prognosis and low operative mortality.

RESUMEN Y CONCLUSIONES

1. Aunque de acuerdo con la literatura el adenoma bronquial puede ser un tumor potencialmente o realmente maligno, nuestras observaciones indican que desde el punto de vista clínico es benigno si se le trata como un tumor epitelial, localmente invasivo, que crece muy despacio.

2. La extirpación broncoscópica es de valor para preparar al paciente para la resección pulmonar, pero no es un tratamiento definitivo porque no se extirpa todo el tumor en por lo menos el 90 por ciento de los casos.

3. Pueden esperarse recidivas tardías (después de 5 a 10 años) subsiguiente a la extirpación broncoscópica. La falta de reconocer y de extirpar esas recidivas puede conducir a la destrucción progresiva de un pulmón entero.

4. Después de dos o tres tentativas de extirpación broncoscópica, si no se restablece la permeabilidad del bronquio, o si ocurre una hemorragia severa, debe abandonarse este tratamiento y hacerse la resección pulmonar.

5. Se informa sobre diez casos de resección pulmonar con un coeficiente de curación de 90 por ciento y una muerte quirúrgica debida a infección. Esta muerte, que ocurrió en el primer caso operado, quizás podría haber sido evitada mediante el uso profiláctico de sulfamerazina y penicilina.

6. Se describe una técnica para la preservación del lóbulo superior aplicable a adenomas situados en un bronquio principal, y que se practica combinando la lobectomía con broncotomía.

7. La resección pulmonar obtuvo un resultado satisfactorio en nueve casos y fue superior a la extirpación broncoscópica en el tratamiento de:

- (a) tumores inaccesibles al broncoscopio y tumores grandes,
- (b) recidivas subsiguientes a extirpaciones broncoscópicas,
- (c) supuración pulmonar más allá del tumor,
- (d) invasión de ganglios linfáticos mediastínicos.

8. No han ocurrido metástasis en ninguno de estos diez pacientes, aunque en tres de ellos se dejó tumor en el muñón pulmonar sin que tuviera lugar extensión aparente.

9. Con la atención preoperatoria y postoperatoria, la anestesia intratraqueal y la técnica quirúrgica modernas, debe urgirse la resección pulmonar en el tratamiento de los tumores benignos del pulmón, especialmente en vista de la baja morbilidad, buen pronóstico y baja mortalidad operatoria.

REFERENCES

- 1 Goldman, A., and Stephens, H. Brodie: "Polypoid Bronchial Tumors with Special Reference to Bronchial Adenomas," *J. Thoracic Surg.*, 10:327, 1941.
- 2 Brunn, H.: "Bronchial Adenoma," Leahy Birthday Volume, pp. 99, Charles C. Thomas, Springfield, Ill., 1940.
- 3 Brunn, H., and Goldman A.: "The Differentiation of Benign from Malignant Polypoid Bronchial Tumors," *Surg. Gynec. and Obst.*, 71: 703, 1940.
- 4 Goldman, A.: "Polypoid Bronchial Tumors with Special Reference to Bronchial Adenoma," *Calif. and Western Med.*, 53:123, 1940.
- 5 Brunn, H., and Goldman, A.: "Bronchial Adenoma," *Am. J. Surg.*, New Series, 54:179, 1941.
- 6 Stout, A. P.: "Cellular Origin of Bronchial Adenoma," *Arch. Path.*, 35:803, 1943.
- 7 Womack, N. A., and Graham, E. A.: "Mixed Tumors of the Lung; So-Called Bronchial or Pulmonary Adenoma," *Arch. Path.*, 26:165, 1938.
- 8 Adams, W. E., Steiner, P. E., and Bloch, R. G.: "Malignant Adenoma of Lung; Carcinoma-Like Tumors with Long Clinical Course," *Surg.*, 11:503, 1942.
- 9 "Case Records, Massachusetts General Hospital," *New England J. Med.*, 218:391, 1938.
- 10 Crafoord, C., and Kingdren, A. G. H.: "Mucous and Salivary Gland Tumors in the Bronchi and Trachea, Formerly Generally Called Bronchial Adenoma," *Acta Chirurg.*, Scandinavica, 92:481, 1945.
- 11 Chamberlain, J. M., and Gordon, J.: "Bronchial Adenoma Treated by Pulmonary Resection," *J. Thoracic Surg.*, 14:144, 1945.
- 12 Graham, E. A., and Womack, N. A.: "The Problem of So-Called Bronchial Adenoma," *J. Thoracic Surg.*, 14:106, 1945.
- 13 Anderson, W. M.: "Bronchial Adenoma with Metastasis to the Liver," *J. Thoracic Surg.*, 12:351, 1942.
- 14 Clerf, L. H., and Bucher, C. J.: "Adenoma (Mixed Tumor) of Bronchus: A Study of 35 Cases," *Ann. Otol., Rhin. and Laryng.*, 51:836, 1942.
- 15 Bigger, I. A.: "Discussion," *J. Thoracic Surg.*, 14:120, 1945.
- 16 Maier, H. C.: "Discussion," *J. Thoracic Surg.*, 14:120, 1945.
- 17 Goldman, A.: "Carcinoma of the Lung of Long Duration," *Medico Surgical Tributes to Harold Brunn*, p. 171, University of California Press, 1942.
- 18 Gebauer, P. W.: "The Differentiation of Bronchogenic Carcinomas," *J. Thoracic Surg.*, 10:373, 1941.
- 19 Karsner, H. T., and Saphir, O.: "Small Cell Carcinoma of the Lung," *Am. J. Path.*, 6:533, 1930.
- 20 Jackson, C. L., Konzelman, F. W., and Norris, C. W.: "Bronchial Adenoma," *J. Thoracic Surg.*, 14:98, 1945.
- 21 Wessler, H., and Rabin, C. B.: "Benign Tumors of the Bronchus," *Am. J. M. Sc.*, 183:164, 1932.
- 22 Englebreth, Holm, J.: "Benign Bronchial Adenoma," *Acta Chirurgica Scandinavica*, 90:383, 1944.

- 23 Foster-Carter, A. F.: "Bronchial Adenoma," *Quart. J. Med. N. S.*, 10: 139, 1941.
24 Adams, R. A.: "Discussion," *J. Thoracic Surg.*, 14:119, 1945.
9884 Santa Monica Blvd., Beverly Hills, Calif.

Discussion

J. J. SINGER, M.D., F.C.C.P.
Beverly Hills, California

The paper presented has shown that bronchial adenoma is a slow growing, rarely metastasizing, epithelial tumor usually located in a stem or lobar bronchus. Some writers state that this tumor is at least potentially malignant, but Dr. Goldman's cases have not developed any metastases. Other authors have noted regional metastases and even distant spread to the liver in one case and to the spine in another.

However, on the basis of his own observation in more than thirty cases, Goldman finds that this tumor does behave differently from cancer, and on this difference has used a new treatment for surgical management of bronchial adenoma. The principle that surgical cure for cancer of the lung demands pneumonectomy rather than lobectomy is adhered to throughout the country. But Dr. Goldman has shown in several cases reported here in his thorough follow-up of eleven cases treated by pulmonary resection, that five-year cure is readily obtained in patients treated with lobectomy. Because many adenomata are located in a stem bronchus without suppurative disease in all lobes on that side, he advocates conserving the non-suppurating lobes by combining bronchotomy with lobectomy. I believe this method of lobectomy combined with bronchotomy is an advance in the surgical treatment of bronchial adenoma.

The earlier we diagnose bronchial adenoma, the less suppurating and the more normal lung will accompany the tumor as a rule. In the future this tumor will probably be diagnosed earlier than in the past. Any treatment that conserves the normal lung and removes the tumor ought to be used, in spite of the fact that we might expect some recurrences ten of fifteen years hence. The open bronchotomy under direct vision leads to a more complete removal than can be accomplished through the bronchoscope, since endo- and extrabronchial portions cannot be removed by the latter method but are readily resected by the former treatment. It would seem that the described method is preferable to bronchoscopic removal, although endoscopic treatment may precede lobectomy plus bronchotomy as in the case reported.

Histoplasmosis—The Pathologic and Clinical Findings*

J. F. KUZMA, M.D.

Milwaukee, Wisconsin

There are now two cases of histoplasmosis recorded in Wisconsin. The first case was encountered in July 1945 and published in June 1946.¹ The second case was published in the same journal several issues later.² The condition is being recognized more frequently in many parts of the country. Histoplasmosis is caused by a yeast-like fungus, *Histoplasma capsulatum*, measuring about 5 microns in diameter, that is "phagocytosed" by the reticulo-endothelial system. This fungus may, therefore, be found in the liver, spleen, bone marrow, lymph nodes, lungs, skin and particularly in the adrenals. In some instances, all tissues of the body are involved.

There are four main clinical features that the disease may show. First, in children who comprise the highest number of cases, the gastrointestinal tract is most frequently involved. This consists of ulcerations of any part of the intestinal tract but particularly the oro-pharyngeal site and the terminal portion of the small bowel. The ulcerations produced in such cases have the clinical findings of abdominal discomfort, vomiting, diarrhea, anorexia and weight loss. In such instances, the stools may be positive for the presence of *Histoplasma capsulatum*. Second is the skin manifestation, as seen in adults or children, particularly in the area of the oronasal regions. These changes vary from papules to ulcers and true abscess formations. Third is the occasional occurrence of predominant cardiac or joint manifestations. Fourth is the visceral involvement including lymph nodes, spleen, liver and lungs. In the cases where the lung findings had been recorded, there is an incidence of 20 per cent that showed changes in the respiratory system. In this series, at least half had clinical evidences that may be confused with tuberculosis. These included pulmonary infiltrations, fever, night sweats, sometimes chills and at other times roentgenographic changes of pulmonary calcification, of pneumonitis and abscess formation. In several of these instances, the disease was associated with tuberculosis.

This disease was first noted by Strong³ in 1906. He did not name

*From the Milwaukee County General Hospital and from the Department of Pathology and Bacteriology, Marquette University School of Medicine, Milwaukee, Wisconsin.

the infection but likened it to leishmaniasis. In the same year, Darling reported his first case and subsequently reported the two others to make a total of three. It is Darling who gave the organism its name *Histoplasma capsulatum* and the disease, therefore, has been called histoplasmosis. More recently, Meleney⁴ has suggested the term of *reticulo-endothelial cytomycosis*. The first case recorded in the United States was in 1926 by Riley and Watson⁵ in Minneapolis. Subsequent to that time, there were some cases recorded on the continent. Then in 1938, cases were again being reported in the United States. There is now a collected number from the literature which amounts to about eighty. Some have been recorded twice and some independently by separate authors so it is difficult to determine accurately the correct number. The states neighboring Wisconsin all have reported cases: Illinois 4, Michigan 10, Minnesota 1, and Iowa 1.

The organism can be cultured and inoculated into laboratory animals. In culturing, it has two forms, a mycelial form which is grown on artificial media and a yeast-like budding form which grows in the presence of animal protein or in tissues. The diagnosis is made most commonly and satisfactorily in the histologic examination of a biopsied lymph node. Cultures should be made for absolute identification; however, in some instances, the organism has been recovered in the stool, bone marrow aspirations and peripheral blood. In a very few instances, blood cultures have been positive.

REPORTED CASE

Our case was that of a sixty-five year old white male who was born in Alsace-Lorraine but had resided for the past thirty-eight years in Milwaukee. He was a sign painter and a dog breeder. In 1938 and 1939 he visited abroad, traveling through England, France, Germany and Switzerland. During his last visit, he was unable to return because of the war. While there, he had seen a physician for heart trouble. In the fall of 1944 when he returned to this country, he again had difficulty with his cardiovascular system. In the spring of 1945, anemia was noted and he received liver therapy. He was admitted to the Milwaukee County General Hospital in July 1945 with complaints of severe weakness, weight loss, anorexia, anemia and inability to walk.

Physical examination revealed a marked anemia with a red cell count of 860,000, white cell count of 1,450 and platelets of 37,000. Blood N. P. N. was 66. The patient exhibited cervical, axillary and inguinal lymphadenopathy in addition to a hepatomegaly and splenomegaly. Both liver and spleen were tender. The patient expired within three days in spite of supportive therapy. Antemortem bone marrow examination was unsuccessful.

Postmortem findings were those essentially of any case of leukemia; that is enlargement of lymph nodes, enlargement of liver and spleen and hyperplastic bone marrow with a grayish cast. The lymph nodes were grayish, speckled with hemorrhages and quite soft. There were no

ulcerations in the skin and mucous membranes, with the exception of the terminal ileum where one small ulcer was identified. The lungs showed a 1.5 cm. peripheral caseous nodule in the lower one-third of the right upper lobe.

Histologic examination, however, was not that of leukemia. There were demonstrable histoplasma bodies throughout all of the viscera with the exclusion of skin and prostate. The thyroid was not studied. The caseous nodule of the lung was composed of eosinophilic granular material surrounded by an area of pneumonitis in which both the alveoli and alveolar walls revealed the presence of huge phagocytic cells containing numerous histoplasma bodies. The heart showed demonstrable interstitial myocarditis with inflammatory granulomatous areas in which there were also macrophages with the ingested histoplasma bodies. Similar changes were very evident in the spleen, liver and bone marrow. Isolated histologic evidences were found in the gallbladder, kidneys, adrenals, gastrointestinal tract and testis.

The pathogenesis of human infection is not understood. In a case such as this, caseous or calcified pulmonary nodules may represent a focal area from which dissemination may take place to produce a picture such as described in this case. The occurrence of such dissemination produces the ordinary picture of a generalized systemic, progressive and fatal disease. This is associated with weakness, fever, weight loss, anemia and leukopenia. Spontaneous infection has been described in dogs^{6,7} and Pinkerton⁸ suggests that animal reservoirs may serve as a source of human infection through the medium of an insect vector.

Concerning pulmonary histoplasmosis, there is a very important finding reported by Palmer⁹ and Furcolow¹⁰ of pulmonary calcifications associated with negative tuberculin skin tests. The map diagram of Palmer showing the percentage of positive histoplasmin reactors among student nurses is startling. According to the map Tennessee, Kentucky, Arkansas, Missouri, Indiana, and parts of Ohio, Illinois, Kansas and Louisiana are the most heavily infected regions. In this area, the percentage is given as 68.3. Similarly, according to Palmer, the percentage of positive histoplasmin reactors among student nurses in specific states is also cited. The highest incidence is seen in Kansas City, Missouri, 58.1 per cent positive reactors, whereas in Minneapolis the percentage is only 4.8. This emphasizes the eastern central states of the country as those predominantly involved. Furcolow has also determined the percentage of histoplasmin positive reactors in Kansas City, Missouri where some 17,000 persons were tested. The first graph taken from his work shows the distribution of tuberculin positive and histoplasmin positive reactors in males and females. It is seen in both males and females that histoplasmin reactors reach a high percentage (70 per cent) between the ages of 5 and 20 years; whereas, the corresponding percentage in tuber-

culosis is reached at about the age of forty-five in both males and females. Likewise, his next graph shows the difference in tuberculin positive reactors by age, sex and race versus that of histoplasmin. It is seen that white and negro males and females have a higher incidence of histoplasmin reactors at the age of eighteen than of tuberculin reactors. It is about 65 per cent positive for histoplasmin and only about 30 per cent positive for tuberculin (the 30 per cent is that of the negro); the white at the same age has a figure of about 12 per cent positive tuberculin reactors. When this is interpreted in the light of percentages with pulmonary calcification, Furcolow shows that in individuals who are histoplasmin negative and tuberculin negative there is less than 5 per cent pulmonary calcification. In those who are histoplasmin negative and tuberculin positive, the percentage with pulmonary calcification is about 17. Those who have a positive histoplasmin and tuberculin skin test have an incidence with pulmonary calcification of less than 30 per cent. However, those with histoplasmin positive and tuberculin negative skin tests have the highest incidence of pulmonary calcification which is slightly greater than 30 per cent. If this is interpreted according to the figures of Palmer, it may be summarized as follows: In his work with nurses, those reacting only to tuberculin have pulmonary calcifications in 10 per cent of the cases; whereas, those reacting only to histoplasmin had a 30 per cent incidence of pulmonary calcification. This then shows that there is a discrepancy between the incidence of pulmonary calcification and positive tuberculin skin tests. It similarly shows that the highest incidence of pulmonary calcification is seen in the group of individuals who are histoplasmin positive. This is further brought out in reference to coccidioidomycosis according to work done by Aronson.¹¹ Aronson had demonstrated that pulmonary calcifications were frequently found in individuals who gave a positive coccidioidin reaction. This work was done with Indians in Arizona and it is his opinion that pulmonary calcifications do not follow the distribution of tuberculin positive skin reactors. It has been said that the individuals who are tuberculin negative and have pulmonary calcifications may represent a type of individual with anergy; however, this is not born out by the fact that some such individuals become positive after a period of time and some who are given an injection of BCG vaccine do develop a positive tuberculin reaction later on.

The individuals who show a positive histoplasmin skin test are, of course, not proven cases of histoplasmosis. It should better be interpreted as a reaction in an individual who has been exposed to the *Histoplasma capsulatum* or some immunologically similar organism. The importance, however, lies in the interpretation of

pulmonary calcifications, more and more of which are being interpreted as non-tuberculous in origin.

SUMMARY

Histoplasmosis is generally a fatal systemic disease caused by the yeast-like fungus named *Histoplasma capsulatum*. This organism may be found within the reticulo-endothelial system. The infection is probably transmitted from animals, notably dogs.

The four principal clinical features of the disease are: 1) Gastro-intestinal manifestations of ulcerations and diarrhea. 2) Skin findings of chronic ulcerations and abscess formations. 3) Cardiac or joint manifestations. 4) Lymphadenopathy, hepatomegaly and splenomegaly. Lung findings are recorded in about twenty per cent of the cases. The findings are not characteristic and are frequently confused with tuberculosis. This is particularly true of pulmonary calcifications. The work of Palmer and Furcolow indicates that there is a high incidence of pulmonary calcifications in people with negative tuberculin tests. A number of such individuals, however, have a positive reaction to the intracutaneous injection of histoplasmin. This work was carried on among student nurses. The highest incidence reported was that in Kansas City, Missouri, where 58.1 per cent were positive skin reactors. It was also shown that there was a difference in the distribution of the positive tuberculin skin reactors and the positive histoplasmin reactors. The majority of the histoplasmin reactors are demonstrable between the ages of five and twenty years of age; whereas, the tuberculin reactors are found in the third and fourth decades. Both white and negro individuals have a higher incidence of histoplasmin positive reactors at the age of eighteen than tuberculin positive. It is likewise shown that in those who are histoplasmin negative and tuberculin positive the incidence of pulmonary calcification is about 17 per cent; however, those with histoplasmin positive and tuberculin negative skin tests have the highest incidence of pulmonary calcifications which is slightly greater than 90 per cent. Somewhat similar studies were also carried out by Aronson in reference to coccidioidin positive reactors and pulmonary calcification. It must be pointed out, however, that the individuals who react positively to this skin test do not have proven or clinical histoplasmosis. The reaction may be due to some immunologically similar infection. It is probably important to consider that quiescent pulmonary calcifications, if they are due to *histoplasma capsulatum*, may serve as the focus for the usual fatal systemic infection.

The cases of histoplasmosis usually have a gross picture similar to that of leukemia. Caseous necrosis of the adrenals is particu-

larly common in these individuals. Histologically the organisms, averaging between 3 and 5 microns and surrounded by a capsule, may be seen throughout the reticulo-endothelial system contained in the phagocytic reticulum cells. From the laboratory standpoint a profound secondary anemia, leukopenia and thrombocytopenia are quite frequent.

There are two cases reported from the state of Wisconsin to date. Neighboring states also have cases: Illinois 4, Michigan 10, Minnesota 1, and Iowa 1.

RESUMEN

La histoplasmosis suele ser una enfermedad orgánica fatal, causada por un hongo parecido a la levadura y llamado el *Histoplasma capsulatum*. Puede encontrarse este organismo dentro del sistema retículo-endotelial. Probablemente algunos animales, especialmente el perro, transmiten la infección al hombre.

Los cuatro rasgos clínicos principales de la enfermedad son: 1) Manifestaciones gastro-intestinales de ulceraciones y diarrea. 2) Hallazgos cutáneos de ulceraciones crónicas y formación de abscesos. 3) Manifestaciones cardíacas o articulares. 4) Linfadenopatía, hepatomegalia y esplenomegalia. 5) Se han anotado hallazgos pulmonares en un veinte por ciento de los casos. Estos hallazgos no son característicos y con frecuencia se les confunde con la tuberculosis, especialmente en el caso de calcificaciones pulmonares. Las investigaciones de Palmer y Furcolow indican que con gran frecuencia ocurren calcificaciones pulmonares en personas que han reaccionado negativamente a la tuberculina. Sin embargo, un cierto número de estos individuos reaccionan positivamente a la inyección intracutánea de histoplasmina. Esta investigación fue llevada a cabo entre estudiantes a enfermeras. Se observó la frecuencia más elevada en Kansas City, Missouri, donde el 58.1 por ciento fueron cutáneo-reactores positivos. También se demostró una diferencia entre la distribución de los cutáneo-reactores positivos a la tuberculina y los reactores positivos a la histoplasmina. La mayor parte de los reactores a la histoplasmina se encuentran en el periodo etario de cinco a veinte años, mientras que los reactores a la tuberculina se hallan en la tercera y cuarta décadas. Entre los individuos de dieciocho años de edad, tanto blancos como de raza negra, hay un mayor porcentaje de reactores positivos a la histoplasmina que a la tuberculina. Se demostró asimismo que en aquellos que son negativos a la histoplasmina y positivos a la tuberculina la frecuencia de calcificación pulmonar es del 17 por ciento, más o menos; empero, los que son positivos a las pruebas cutáneas con histoplasmina y negativos a la tuberculina presentan el más alto porcentaje de calcificaciones

pulmonares, el que asciende a un poco más del 90 por ciento. Aronson también llevó a cabo estudios algo semejantes referentes a reactores positivos a la coccidioidina y calcificaciones pulmonares. Es necesario observar, sin embargo, que los individuos que reaccionan positivamente a la prueba cutánea con histoplasmina no tienen histoplasmosis clínica o comprobada. Es posible que la reacción se deba a una infección inmunológicamente semejante. Probablemente, es importante tener en cuenta que calcificaciones pulmonares quiescentes, si son causadas por el histoplasma capsulatum, pueden servir de foco de la infección general que es usualmente fatal.

Los casos de histoplasmosis generalmente presentan un cuadro macroscópico semejante al de la leucemia. En estos individuos es particularmente común la necrosis caseosa de las cápsulas suprarrenales. Histológicamente, los organismos, que miden de 3 a 5 micrones y que están rodeados de una cápsula, se encuentran dentro de los fagocitos del retículo a través del sistema retículo-endotelial. Desde el punto de vista de laboratorio, es bastante frecuente una anemia secundaria profunda con leucopenia y trombocitopenia.

Hasta la fecha, se ha informado sobre dos casos en el Estado de Wisconsin. Los Estados vecinos también han tenido casos, a saber: 4 en Illinois, 10 en Michigan, 1 en Minnesota y 1 en Iowa.

REFERENCES

- 1 Kuzma, J. F., and Schuster, Myron: "Histoplasmosis—Reticulo-endothelial Cytomycosis," *Wis. M. J.*, 45:591-595, (June) 1946.
- 2 Swan, L. L., and Finnegan, J. V.: "Histoplasmosis; Report of Case with Autopsy," *Wis. M. J.*, 45:763-765, (Aug.) 1946.
- 3 Strong, R. P. (cited by Ziegler, Edwin): "A Study of Some Tropical Ulcerations of the Skin with Particular Reference to their Etiology," *Philippine J. Sci.*, 1:91, 1906.
- 4 Meleney, H. E.: "Histoplasmosis (Reticulo-endothelial Cystomycosis): Review with Mention of 13 Unpublished Cases," *Am. J. Trop. Med.*, 20:603-616, (July) 1940.
- 5 Riley, W. A., and Watson, C. J.: "Histoplasmosis of Darling; Case Originating in Minnesota," *Am. J. Trop. Med.*, 6:271-282, (July) 1926.
- 6 De Monbreun, W. A.: "Dog as Natural Host of Histoplasma Capsulatum; Report of Case of Histoplasmosis in this Animal," *Am. J. Trop. Med.*, 19:565-587, (Nov.) 1939.
- 7 Tomlinson, W. J., and Grocott, R. G.: "Canine Histoplasmosis," *Am. J. Clin. Path.*, 15:501-507, (Nov.) 1945.
- 8 Pinkerton, H.: "Histoplasmosis: Reticulo-endothelial Cytomycosis: Histoplasmosis of Darling: Cytomycosis of Darling," *Oxford Medicine*, 5:422, (July 18) 1944.
- 9 Palmer, C. E.: "Nontuberculous Pulmonary Calcification and Sensitivity to Histoplasmin," *Pub. Health Reports*, 60:513-520, (May) 1945.
- 10 Furcolow, M. L., High, R. H., and Allen, M. F.: "Some Epidemiological Aspects of Sensitivity to Histoplasmin and Tuberculin," *Pub. Health Reports*, 61:1132-1144, (Aug.) 1946.
- 11 Aronson, J. D., Saylor, R. M., and Parr, E. I.: "Relationship of Coccidioidomycosis to Calcified Pulmonary Nodules," *Arch. Path.*, 34:31-48, (July) 1942.

A Critical Study of Pneumoperitoneum and Phrenic Nerve Crush in Pulmonary Tuberculosis*

ALLAN HURST, M.D., F.C.C.P., H. M. MAIER, M.D.

RALPH DWORK, M.D.**

Denver, Colorado

While pneumoperitoneum with or without phrenic nerve interruption has been used in the treatment of pulmonary tuberculosis for several years, most writers using this form of treatment have hesitated to present a statistical report of their results. Banyai,¹ in 1938, reporting on the use of pneumoperitoneum without phrenic interruption in 120 cases of pulmonary tuberculosis states, "Because of the grave prognosis in most of my patients, no attempt is made to present a statistical analysis." Burge,² Hobby,³ Trimble,⁴ Rudman,⁵ Stokes,⁶ and others have stated their limited indications for this procedure, cited short case reports, but have not further reported their results. There have been attempts by others as Rilance and Warring,⁷ and recently Crow and Whelchel,⁸ and Anderson and Winn⁹ to analyze their results. These latter investigators have been considerably more optimistic in their reports. It is most interesting to note that certain sections of the country have used this form of treatment extensively, while in others it is used little or not at all. Recently (January 1946, American Review Tuberculosis) the Committee on Therapy of the American Trudeau Society stated that a survey of institutions with an aggregate total of over 25,000 occupied beds showed that there were 1600 cases presently receiving pneumoperitoneum. It must be granted that this form of therapy is having a wave of enthusiasm equal to no other treatment previously but artificial pneumothorax.

Some of the earlier reports gave the indications for pneumoperitoneum alone or combined with phrenic paralysis as limited to bilateral extensive disease. Where pneumothorax was unsuccessful and extensive surgery was not possible, such a procedure was considered as a preliminary measure. Additional indications were those of advanced age, basal emphysema, combination with inadequate pneumothorax, previous phrenic procedure, and hemoptysis.

*Condensed from a paper presented at the Twelfth Annual Meeting, American College of Chest Physicians, San Francisco, California, June 29, 1946.

**From the National Jewish Hospital at Denver, Colorado, and the University of Colorado School of Medicine.

The two most recent reports have been enthusiastic and the authors make a plea for more extensive use of this procedure. They have extended their indications to the point where evaluation of their results becomes extremely difficult.

This presentation is based on a review of 103 cases of phrenic interruption and pneumoperitoneum with a critical attempt at evaluation and delineation of criteria for its use. All cases included in this series were those treated during the past 4 years with phrenic interruption and pneumoperitoneum. The extent of the lesion was classified by the National Tuberculosis Association standards, and as shown in Table I, there were 4 minimal, 47 moderately advanced, and 52 far advanced cases.

TABLE I—EXTENT

Minimal	Moderately Advanced	Far Advanced
4	47	52
<i>Location of Principal Lesion</i>		
UPPER	75	LOWER 12
MID	8	DIFFUSE 8

In this series there were 75 upper lung field lesions, 8 mid and 12 lower; 8 cases had diffusely spread processes. It is to be noted that of the 8 cases with cavities in the lower lung field, 1 closed, and of the 6 cases with cavities in the mid-lung field, 2 closed. These proportions are not significantly different from those found with closure of upper lobe cavities. In the series of 103 cases, 11 cases showed retraction of a lobe or a bronchopulmonary segment chiefly confined to the upper lung field. In 7 the cavity became smaller, in 2 there was no effect, in 1 there was no cavity present,

TABLE II—MAXIMUM RISE IN DIAPHRAGM

1 CM—2	8 CM—14
2 CM—3	9 CM—10
3 CM—8	10 CM—6
4 CM—10	11 CM—1
5 CM—8	12 CM—2
6 CM—15	13 CM—1
7 CM—13	14 CM—1
SMALL (?)—7	
LARGE (?)—2	

and in 1 the cavity became larger. Although a lobe or a segment became smaller in size, and tended to retract, it is significant that in no case was a cavity closed in the entire series by retraction.

As noted in Table II, 94 cases showed a definite rise of the diaphragm, measuring from 1 to 14 cm. Measurements were made from the tubercle of the 1st rib to the highest point of the diaphragm, on the x-rays showing maximum rise. In 9 cases the diaphragm could not be accurately visualized for measurement, and an attempt at some comparison was made by calling such cases "small" and "large" rise. Fifty-two cases showed a rise of 6 to 9 cm., and although there was no constant relationship found between degree of rise and effect, the cases with cavity closure averaged a 7 cm. rise.

Reference will be made later in the discussion as to the question of selection of cases for treatment. The inclusion of early exudative lesions with a high tendency to retrogression spontaneously will of necessity give a higher proportion of good results with treatment. Similarly the figures in any one reported group as to the percentage of good results will be dependent upon the types of cases selected for treatment. Since the group presented here represents essentially an older type of lesion, it was of some interest for us to analyze the time elapsed between date of diagnosis and admission. Although such a time interval does not properly represent the true age of the lesion, it gives some index in an over all comparison. In 43 cases only one year or less had elapsed between diagnosis and admission, while 60 cases had periods extending from 2 to 5 and more years. A comparison between cases showing closure of cavity, and those remaining patent, revealed that the group with a "good result" were considerably "earlier" cases as compared with those that did not respond.

CAVITY CLOSURE

In order to critically evaluate the results of treatment, it is usually necessary to review as many x-ray films as possible taken prior to the institution of therapy to note the direction in which the lesion is going. This was possible to do in a fair proportion of cases where x-rays were available, or the patient had remained in the hospital a sufficient time before treatment was instituted. Table III reveals that there was closure of cavities in 9 cases, and shrinkage of cavities in 8 others prior to institution of therapy. Of the 9 cases whose cavities closed, 1 reopened after treatment was begun, and among the 8 cases which became smaller before treatment was instituted, 2 closed after treatment was begun. Of the 6 that remained, 2 showed no change, 2 became smaller, 1 larger, and 1 closed and reopened.

TABLE III — TENDENCY TO RETROGRESSION PRIOR TO
INDUCTION OF PHRENIC AND PNEUMOPERITONEUM
(Observed either on pre-admission films or before treatment was begun)

	Before Treatment	After Treatment
Cavity Smaller	8	2 No Change, 1 Closed and Reopened 2 Closed, 1 Larger 2 Smaller
Cavity Closed	9	1 Reopened After Treatment was Started

The effects of phrenic interruption and pneumoperitoneum on cavity closure are shown in Table IV. There are 102 cases included in this series, since one case was eliminated because of the short duration of the treatment. In 38, no cavity was present, and in the remaining 64 cases, 30 showed no change. Only 7 cases with cavity actually closed, 2 of which had become definitely smaller prior to the induction of therapy. Eleven more became smaller, 2 of which had already begun to show signs of closing prior to induction of treatment. It is to be noted that the period of x-ray observation prior to institution of therapy was longer in the group with spontaneous closure.

TABLE IV — EFFECT OF PHRENIC AND
PNEUMOPERITONEUM ON CAVITY

None Present	38 (8 had closed prior to induction)
No Effect	30
Smaller	11 (2 had already become smaller pre-induction)
Closed	7 (2 had already become smaller pre-induction)
Larger	12 (1 had closed pre-induction, reopened and ballooned out)
Closed and Reopened	3 (1 had already become smaller pre-induction)
Smaller and Larger	1 (had already become smaller pre-induction)
1 Cavity that showed no change not counted because of short duration of treatment.	

EFFECT ON INFILTRATION

As to the effects on the lesion itself by treatment, 29 cases with or without cavity showed definite clearing of the lesion. Thirteen of these began prior to treatment either associated with cavity changes or alone. Of these, 4 showed the same tendency bilaterally, before treatment, and cleared further simultaneously with treatment. Six with no previous observation period, showed clearing with pneumoperitoneum symmetrically on both sides. Nine showed clearing of a unilateral lesion, and 1 showed clearing of a bilateral lesion followed later by hematogenous spread and death.

Eight cases showed fibrosis, 1 of which showed a simultaneous fibrosis bilaterally, and 4 of the 8 started prior to treatment. In 1 of the 8 cases there was questionable fibrosis because of the appearance given by the retraction of the bronchopulmonary segment, and in another case, there was initial fibrosis followed later by spread of disease.

A review of the time factor between date of admission and phrenic interruption showed that in 23, the phrenic interruption was present or done on admission. In 46 additional cases, phrenic interruption was done up to 3 months, and 13 more up to 6 months. The remaining 21 cases were done from 6 months to more than 2 years after admission. As to the interval between phrenic interruption and induction of pneumoperitoneum, in 11 cases the pneumoperitoneum was begun first. As pointed out in other reports, there is a great advantage in such a procedure in that it provides a test for diaphragmatic adhesions and rise following phrenic crush. In 53 additional cases, the pneumoperitoneum was induced within a few days to a week after phrenic interruption.

Phrenic crush and pneumoperitoneum were used as a primary procedure in 51 cases. In the remaining 52 cases, pneumothorax had been previously unsuccessful. In 9 cases, therapy was discontinued because of inadequate rise of the diaphragm, and in 25 as clinically ineffective.

In Table V, it is noted that 23 patients were improved (conversion

TABLE V — EFFECT ON LABORATORY DATA

	Total	<i>S t a g e</i>		
		I	II	III
Improved	23	1	15	7
Unchanged	73	3	30	40
Worse	7		2	5
Total	103	4	47	52

TABLE VI — EFFECT ON CLINICAL CONDITION

	Total	<i>S t a g e</i>		
		I	II	III
Improved	47	4	23	20
Unchanged	37		18	19
Worse	19		6	13
Total	103	4	47	52

of sputum) in the 103 cases studied. Table VI shows a larger number, 47, improved as to clinical condition, demonstrating again some of the palliative effects of treatment.

The complications of artificial pneumoperitoneum have been listed by many authors. In few instances, however, have the complications been of sufficient magnitude to cause discontinuation of therapy. It is not always easy to decide exactly when the appearance of a new symptom or sign is actually a complication of the treatment or an associated condition. There were 2 deaths during treatment, 1 from so-called shock and the other a tuberculous enteritis which developed while the patient was under treatment. The appearance of extensive peritoneal exudate with symptoms has been heralded, by some, as the onset of a tuberculous peritonitis. In 2 cases this sign together with fever was present, diagnosed as probable tuberculous peritonitis, and considered cause for discontinuation of therapy. One patient developed gangrenous appendicitis with local peritonitis. The case was operated on successfully, but it must be said that the diagnosis was difficult because of the associated pneumoperitoneum. In 2 cases precordial pain appeared shortly after the onset of treatment. In both cases treatment was stopped. Other causes of discontinuation of therapy were dyspnea in 4 cases, 1 case of duodenal ulcer which became worse under treatment, abdominal pain in 3 cases, 1 with appendiceal signs, 1 case of femoral thrombosis, 2 of severe nausea and vomiting, and 3 of severe diarrhea. With more careful selection of cases such a large proportion of complications might possibly have been reduced. In one case mediastinal emphysema appeared; in another a spastic colon became worse and finally 2 cases showed a marked loss of appetite. None of these symptoms, however, were severe enough to cause discontinuation of treatment.

DISCUSSION

An evaluation of any form of therapy in tuberculosis is extremely difficult. The need for active treatment of the open cavity case has been especially stressed with Barnes and Barnes¹⁰ figures of 90 per cent fatality in 5 years in such cases. The ability of tuberculous lesions to retrogress with spontaneous closure of cavities has been similarly stressed and the finding in mass x-ray surveys of two-thirds of all cases of pulmonary tuberculosis in an arrested or cured condition is well known. One of the most optimistic reports of cavity closure has been that of Fales and Baudet¹¹ who showed that 46.6 per cent of all cavities closed on bed rest while 66 per cent of "exudative" cavities closed in the same series.

As to location of cavity for effect of treatment, there is no unanimity of opinion in the literature. Of the 7 cavities which

closed with treatment, 2 were in the midlung field. No case of cavity in the lower lobe closed with treatment alone.

Absorption of exudative lesions and fibrosis is similarly difficult to evaluate. In many instances absorption began before institution of therapy, and the lesions continued to retrogress after treatment was begun. The most striking fact was the observation that bilateral lesions cleared simultaneously although the paralyzed hemidiaphragm was considerably more elevated and should theoretically have shown a more unilateral effect. This observation would lead us to feel that the degree of rise of the diaphragm is not the most significant factor in the retrogression of such lesions.

In the papers on the use of pneumoperitoneum and phrenic by Crow and Whelchel,⁸ and Anderson and Winn,⁹ the results were compared with those obtained with therapeutic pneumothorax. In the papers by these authors, each group had approximately 85 per cent exudative disease and showed cavity closure in 63.3 per cent and 58.4 per cent respectively. If one is willing to admit that the combined procedure is nothing more than an exaggerated or "better" phrenic, the problem of results and indications becomes simplified. Recalling the figures of Fales and Baudet,¹¹ there is a striking resemblance between spontaneous regression and the results of this therapy.

The apparent discrepancy between our results and those recently quoted has been observed repeatedly in other series with the use of phrenic interruption alone. Bronfin¹² in his discussion of O'Brien's results with phrenicectomy pointed out that the latter's material was not comparable with that observed in other institutions whose patients are of the more advanced and chronic types. Of O'Brien's 378 cases, 236 had thin walled cavities with 58.8 per cent closure. Potter¹³ et al, in a later study went so far as to say, "It can readily be seen how favorable results will multiply almost unbelievably when lesions either in the stage of spontaneous resolution or having the capacity to heal on a bed rest regime, are managed by some form of operation on the phrenic nerve." Our study leads us to a similar opinion as that of Potter with the use of the combination of pneumoperitoneum and phrenic interruption.

It is important to differentiate between phrenic interruption with pneumoperitoneum and pneumoperitoneum alone. The phrenic nerve operation carries with it a rather large possibility of permanent paralysis of the diaphragm. Figures vary from 6 to 10 per cent and constitute a difficult problem in future surgical collapse. Even where the diaphragm has apparently regained its usual motility on fluoroscopic examination, there is reason to believe that a partial atonicity is still present. In addition, time for re-

covery not infrequently delays further surgical procedure. The results obtained in this study would not justify the wide spread use of phrenic interruption and pneumoperitoneum. The high proportion of permanent phrenic paralysis and the time factor involved in awaiting further surgery have been cited as deterrents to such a procedure. In addition, the institution of a more definitive collapse measure such as pneumothorax, thoracoplasty, or resection may be delayed in the frequently vain hope of promising results with phrenic and pneumoperitoneum alone.

The indications for phrenic interruption have not been definitely clarified after 35 years of use. The cases selected for treatment have been in many instances those that might very well have done as well on bed rest. For this reason results have varied depending on the type of cases included in the series, with a higher percentage of cures in the cases with early "exudative" cavitation.

While this paper does not deal properly with the use of pneumoperitoneum as a single procedure, certain impressions have been gathered in the last 6 months. The principal use for this treatment has been in cases of extensive bilateral disease. It is interesting to note the almost complete agreement of several authors in this limited indication.

Trimble⁴ states, "It is also very important to be keenly aware of not only the physical, but psychological problems involved in the individual patient. At the other end of the clinical picture, there comes a point where no therapeutic measure at our command seems to be indicated. It would seem that pneumoperitoneum can be used in a patient who is more seriously ill with bilateral pulmonary tuberculosis than any other measure except the fundamental one of bed rest under proper sanatorium conditions."

Stokes,⁶ in the conclusion to a paper entitled, "Pneumoperitoneum for Pulmonary Tuberculosis," says, "as a measure of pulmonary compression, pneumoperitoneum has very limited application in the treatment of pulmonary tuberculosis. However, where other measures either fail or cannot be utilized it may aid in the control of hemoptysis, and in reduction of toxemia. In this way an otherwise unsuitable case can sometimes be prepared for surgical intervention."

Banyai,¹ in 1938, stated, "I do not propose to consider pneumoperitoneum equal to any other accepted mechanical measure (it has its limitations and its advantages), but knowing that almost one-half of our sanatorium admissions arrive with a far advanced tuberculosis, it should be used as a matter of expediency in many instances rather than to leave the patient to his fate without any constructive treatment."

Mallick, et al,¹⁴ reporting on a series of 176 cases treated in

India, showed that of 146 with positive sputum, only 15.6 per cent turned negative. A large percentage of the cases that remained positive were so improved, however, as to be able to resume some form of work. They state, "Pneumoperitoneum has a great palliative and in certain cases even a curative value. Its real merit lies in its particular applicability to advanced bilateral cases, which are by no means few in a country like India, where measures in the early detection and consequent management of the disease are yet in infancy, and for a fairly large number of which we have nothing more to offer than the fundamental principal of rest in bed."

Fowler¹⁵ says, "Its true value appears to lie in the ability to improve the patients general condition and alter the course of the pathological process, as demonstrated by x-ray in such a manner that a more direct approach by radical surgical measures become safe."

In a small series of cases of pneumoperitoneum treated at this Hospital without the use of phrenic interruption, the statements of the previous authors have been born out to a large extent. In patients with extensive bilateral disease, in whom bed rest produced little or no change, and where collapse therapy was impossible, pneumoperitoneum succeeded in improving their morale in a large measure. There was gain in weight, lessening of cough and expectoration, and occasionally slight changes noted on x-ray in the nature of improvement. As Trimble⁴ has pointed out, such a mode of therapy has a very useful function in psychologic problems related to the tuberculous, particularly when the patient observes that despite deterioration of his condition or lack of progress no treatment other than bed rest is given him.

We have also used pneumoperitoneum in those cases of unilateral disease in which a spread has occurred to the lower lung field, and there is some necessity for waiting prior to the institution of surgical collapse therapy for the cavity in the upper lobe. Here the institution of phrenic nerve interruption would delay the operation unnecessarily until function of the diaphragm had been restored. There is some rise of the diaphragm with pneumoperitoneum alone of at least one interspace where adhesions are not present. Such a rise, and the concomittant limitation of motion of the diaphragm, further aids in the clearing of the process in the lower lung field.

It is our feeling then, that pneumoperitoneum alone has some value because of the positive psychological effect which it has in some cases of bilateral extensive tuberculosis, and also as a preparation of patients for surgery. The small number of complications which occur with pneumoperitoneum is not sufficient

to deter the clinician in using this procedure should he feel that it will be of any benefit at all. Should adhesions prevent the rise of the diaphragm for any reason it can be discontinued immediately.

One more use for pneumoperitoneum is in combination with pneumothorax. In certain instances of gross adhesions at the upper portion of the chest wall, relaxation of the diaphragm will assist in closure of the cavity. Here the pneumoperitoneum can be used as a preliminary measure to phrenic to test the rise of the diaphragm, and its effect upon the cavity. The value of this preliminary procedure would be to decide whether or not the phrenic will be of value.

CONCLUSIONS

1. A study of 103 cases of phrenic nerve crush and pneumoperitoneum has been presented.
2. It has been shown that cavities in 9 cases closed prior to institution of treatment, while only 7 additional cases showed closure of cavities with treatment.
3. Where clearing of infiltration occurred following treatment, such clearing occurred simultaneously in bilateral cases and did not appear to be influenced to a greater extent on the side of the paralyzed hemidiaphragm.
4. The limited indications of pneumoperitoneum without phrenic interruption are presented and its value as a psychologic measure in the treatment of tuberculosis is emphasized.

CONCLUSIONES

1. Se ha presentado un estudio de 103 casos de trituración del frénico y neumoperitoneo.
2. Se ha demostrado que en 9 casos se cerraron cavernas antes de comenzar el tratamiento, mientras que sólo en 7 casos adicionales se cerraron cavernas con el tratamiento.
3. En los casos en que se aclaró la infiltración después del tratamiento, tal aclaramiento ocurrió simultáneamente en casos bilaterales y no pareció haber sido influenciado más en el lado del hemidiafragma paralizado.
4. Se presentan las limitadas indicaciones del neumoperitoneo sin la interrupción del frénico y se hace hincapié sobre su valor como medida psicológica en el tratamiento de la tuberculosis.

REFERENCES

- 1 Banyai, A. L.: "Artificial Pneumoperitoneum," *Medical Record*, 148: 431, 1938.
- 2 Burge, F. W.: "Pneumoperitoneum, Oxyperitoneum, and Nitroperitoneum in the Treatment of Pulmonary Tuberculosis," *Dis. of Chest*, 4:14-18, 1938.

- 3 Hobby, A. W.: "Pneumoperitoneum, An Adjunct to the Treatment of Pulmonary Tuberculosis," *Dis. of Chest*, 4:18-20, 1938.
- 4 Trimble, H. G.: "Pneumoperitoneum in the Treatment of Pulmonary Tuberculosis," *Dis. of Chest*, 4:18-21, 1938.
- 5 Rudman, I. E.: "Pneumoperitoneum," *Am. Rev. Tuberc.*, 48:334, 1943.
- 6 Stokes, J. B.: "Pneumoperitoneum for Pulmonary Compression," *Ill. M. J.*, 73:137, 1938.
- 7 Rillance, A. R., and Warring, F. C.: "Pneumoperitoneum Supplementing Phrenic Paralysis," *Am. Rev. Tuberc.*, 49:353, 1944.
- 8 Crow, H. E., and Whelchel, F. C.: "Diaphragmatic Paralysis and Pneumoperitoneum—Therapeutic Observations in White Patients," *Am. Rev. Tuberc.*, 12:367, 1945.
- 9 Anderson, N. L., and Winn, W. D.: "Pneumoperitoneum and Diaphragmatic Paralysis—Therapeutic Observations in 110 Negroes," *Am. Rev. Tuberc.*, 12:380, 1945.
- 10 Barnes, H. L., and Barnes, L. R. P.: "The Duration of Fatal Phthisis," *Am. Rev. Tuberc.*, 20:895, 1929.
- 11 Fales, L. H., and Baudet, E. A.: "Healing of Tuberculous Cavities," *Am. Rev. Tuberc.*, 30:225, 1934.
- 12 Bronfin, I. D.: "Discussion of Dr. O'Brien's Paper," *Tr. Nat. Tuberc. Assn.*, 126, 1930.
- 13 Potter, B. P., Berry, F. B., and Bortone, F.: "Phrenic Interruption in the Treatment of Pulmonary Tuberculosis—Five-year Study and Follow-up," *J. Thoracic Surg.*, 6:424, 1937.
- 14 Mallick, S. M. K., Malhotra, C. L., and Mohammad, N.: "Pneumoperitoneum in Treatment of Tuberculosis, A Report of 176 Cases," *Tubercle*, 24:165, 1943.
- 15 Fowler, W. O.: "Pneumoperitoneum in the Treatment of Pulmonary Tuberculosis," *Am. Rev. Tuberc.*, 44:474, 1941.

Discussion

HAROLD W. KOHL, M.D., F.C.C.P.

Tucson, Arizona

The very fact that pneumoperitoneum is having a wave of popularity and enthusiasm today demands that critical studies of the indications for and the results of this form of therapy be undertaken by pthysiologists again and again, until its true worth is established. Dr. Hurst and his co-workers have, by their discussion, made a valuable contribution to the overall estimate. A careful breakdown of their series of cases indicates to us that pneumoperitoneum is of questionable, or at best, of very limited benefit in the treatment of the lesions of pulmonary tuberculosis. This has also been our experience.

It is imperative that something aggressive be undertaken in those unfortunate cases where no form of therapy other than bed rest seems, at the moment, indicated. The morale of the individual concerns us greatly and every possible effort must be made to bolster that morale. A tendency toward normalization of the psychiatric balance of the patient occurs with every new hope offered him. Change of residence, change of physician, re-

action to mild exercise such as bathroom privileges, and the use of intravenous therapy, such as calcium, which we generally recognize to be without material benefit, are examples of these new hopes. So in advanced bilateral cases of tuberculosis suited to no therapy other than bed rest, why should pneumoperitoneum not be employed at times if only for its psychological benefit? Certainly in institutions where the patient pays an overall fee coverage or where treatment is rendered without charge, there should be no objection. However, it seems to us that less aggressive measures should be offered to patients not in the above categories for the betterment of their psychiatric status alone.

One further indication for pneumoperitoneum not referred to by Dr. Hurst seems worthy of mention. In some women, pregnant and afflicted with pulmonary tuberculosis, we have seen dramatic improvement in general physical condition and also definite regression of the pulmonary lesions. In some of these cases we have been particularly pleased with the postpartum progress where pneumoperitoneum has been employed as a substitute for the intra-abdominal pressure occasioned by the pregnant uterus.

Discussion

O. C. SCHLACK, M.D., F.C.C.P.

Oak Forest, Illinois

Dr. Hurst and his associates are to be congratulated on presenting before the medical profession again, the value of instituting artificial pneumoperitoneum in the treatment of pulmonary tuberculosis.

Early in 1932 at Oak Forest, we had accidentally produced artificial pneumoperitoneum in a patient who had a phrenic nerve interruption and was getting artificial pneumothorax. The diaphragm was pierced accidentally and air was introduced into the peritoneal cavity instead of the pleural cavity. We were happily surprised to find that the diaphragm had a pneumatic pad underneath which had pushed the diaphragmatic leaf higher than before the artificial pneumoperitoneum was established.

In 1936, Dr. Joannides and myself reported in the *Journal of Thoracic Surgery*, the value of artificial pneumoperitoneum in collapse therapy of pulmonary tuberculosis as an adjunct to phrenic nerve interruption. In the Tuberculosis Hospital at Oak Forest, we use this form of collapse therapy primarily in patients in whom phrenic nerve interruption is not effective because of limited tonus of diaphragm.

In order to explain our indications of artificial pneumoperitoneum it may be advisable to discuss the mechanics of diaphragmatic paralysis. At each inspiration, air is introduced through the tracheo-bronchial tree into the lung by virtue of a downward contraction of the diaphragm and an upward pull of the ribs through the action of the intercostal muscle, thus a higher negative pressure is produced in the pleural cavity which causes air to be sucked into the lung. The lung, because of the large amount of its elastic tissue, has a natural tendency to contract, therefore, as the contraction of the diaphragm is eliminated by phrenic nerve paralysis about one-third inspiratory capacity is eliminated. The lung expansion, therefore, is limited in proportion to diminished negative pressure in the pleural cavity. By introducing air into the peritoneal cavity and making the patient remain in a semi-sitting position or making the patient wear a belt to produce contraction of the abdominal muscles, the air in the peritoneal cavity has a tendency to find its way underneath the paralyzed diaphragm. By exerting additional intraabdominal pressure through contraction of the abdominal muscles or in the act of coughing, there is a mechanical pressure exerted on the paralyzed diaphragm pushing it up higher than its normal relaxed level. This mechanism enhances further contraction on the elastic tissue of the lung and thus the paralyzed diaphragm is pulled up to a higher level where it is likely to stay because of its inability to contract. In this way we have seen diaphragmatic leaves which under ordinary conditions were pulled up one or two interspaces, to rise as high as the 4th, 3rd or even the 2nd interspace by the use of artificial pneumoperitoneum. When this rise is once established it is no longer necessary to continue artificial pneumoperitoneum and the activity of the lung is further reduced by the diminution of space in the pleural cavity due to the mechanical rise of the diaphragm into the thorax. In this way, the lung is given the opportunity to remain at its minimum expansible capacity, encouraging healing of the tuberculous process.

This therapy, though valuable, is not without danger. In a patient with abdominal adhesions it is quite easy to puncture the abdominal viscera and introduce serious damage to the gastrointestinal organs. In one case, we had encountered even a typical picture of air embolism which cleared up under proper treatment. In this case the point of injection was rather high and undoubtedly the lung and the diaphragm were punctured at the costo-phrenic angle thus introducing the air into the pulmonary circulation and causing syndrome of air embolism.

In our routine we maintain artificial pneumoperitoneum long enough to produce a satisfactory rise of the diaphragm and then

discontinue artificial pneumoperitoneum. Our results prove our concept of the mechanism of artificial pneumoperitoneum because we have seen the diaphragm stay up permanently. In one case the diaphragm remained in this position as long as 10 years after discontinuing pneumoperitoneum.

It is necessary that enough of the air be injected into the peritoneal cavity, as much as a maximum of 3000 cc. of air may be necessary, so that the pneumatic pad will find its way under the paralyzed diaphragm. The contracting diaphragm on the non-paralyzed side has a tendency to push the air under the paralyzed diaphragm on inspiratory contraction. If too much air is introduced so that the pressure is exerted on non-paralyzed diaphragm the patient complains bitterly of pain in the shoulder and inspiratory pain giving all the symptoms referable to a typical Hedblom's Syndrome on patients in whom the diaphragm has not been paralyzed.

I wish again to congratulate Dr. Hurst and his associates for the excellent presentation of this important subject.

Discussion

HAROLD GUYON TRIMBLE, M.D., F.C.C.P.
Oakland, California

Pneumoperitoneum, in our hands, is definitely helpful in the healing of patients with certain types of pulmonary tuberculosis. I should not like to have to look after these patients with pulmonary tuberculosis and not be able to use this procedure.

I wish that pneumoperitoneum was a better procedure. I wish that it would do more to more patients with pulmonary tuberculosis and do it more quickly. But, after all, penicillin has its limitations. Sulfa drugs are excellent in controlling certain types of infection, and for others they have no value. We wish that insulin would be more effective in the control of diabetes, but still it certainly has a definite place in management of the average diabetic.

Knowing the types of patients Dr. Hurst has in his institution, I want to point out that practically all of these patients have had attempts at taking the cure elsewhere. Having failed they then seek admission to the National Jewish Hospital, so this material is immediately selected and is necessarily difficult to do anything with, with any procedure. I take it that most of these patients have had adequate care before.

With regard to the use of any type of phrenic interruption

with pneumoperitoneum, when we started using pneumoperitoneum some ten years ago, it was our practice to routinely do some type of phrenic operation on the most involved side. As time went by, we began to do less of this and finally, after we came to realize that temporary phrenic interruption is not always what it seems, and not only may, but frequently does, result in a permanent paralysis of the diaphragm, we began to use it much less frequently. About this time studies on measuring the vital capacity and oxygen exchange of each lung separately coming from Oslo, Norway, and particularly in this country by Pinner and associates from Mont-fiore Hospital in New York, confirmed our previous clinical impression that phrenic paralysis was not an innocuous procedure. For some years, then, we have used phrenics but rarely and only for specific indications. The net result of this is that we currently do very few.

With regard to the psychological effect of pneumoperitoneum, of course, any treatment that is successful builds up in the patient a favorable psychology. As a matter of fact, some treatments that are not successful can do the same thing temporarily, but this, of course, can not last and is bound to catch up with both the doctor and the patient eventually. It is difficult for me to understand how psychology alone can give us the marked changes we see in the x-ray films when pneumoperitoneum is used. For the 15 years previous to the time this procedure was used by us, we had the same type of patients at complete bed rest alone, and while such favorable pathological changes would occasionally occur, the x-ray pictures in similar cases, with pneumoperitoneum as we have been using it, is certainly very different. We have made an analysis of our cases up to and including 1942, and at the present time are engaged in a careful study of our cases for the last ten years.

While we started using pneumoperitoneum as a procedure only where other types of collapse therapy could not be initiated or else had failed, with observation of more cases over a longer period of time, we have broadened our indications so that we have come to use it in many instances as a primary procedure. It is particularly applicable and especially effective with bilateral infiltrations without cavitation. We consider it almost specific for these types of lesions. This does not mean that its use should be restricted to those alone. Increasing use of the procedure has confirmed our early impressions that pneumoperitoneum had a definite and rather substantial place in the collapse therapy of pulmonary tuberculosis.

Patent Ductus Arteriosus; Present Surgical Status*

JAMES W. NIXON, M.D., F.C.C.P.

San Antonio, Texas

After eight years of surgical treatment of patent ductus arteriosus the stage has been reached when a general survey of the progress made would seem warranted.

As early as 1907, Munro¹ suggested the surgical ligation of a patent ductus arteriosus, and at necropsy demonstrated a possible operative approach. However no attempt to ligate a ductus in a living patient was reported in the literature until May 1938, when Graybiel, Strieder, and Boyer² reported an attempt to obliterate a patent ductus in a patient with subacute bacterial endarteritis. Because recovery from this complication was extremely rare, they felt justified in taking this pioneer step; and although the patient died on the fourth postoperative day of acute dilatation of the stomach, the operation was definitely a step forward. According to Gross¹⁴ an earlier unsuccessful attempt to ligate a ductus had been made by O'Shaughnessy. The first successful ligation was performed by Gross and Hubbard⁶ in August 1938. Dolley⁴⁰ stated that this success aided Dr. Jones and Dr. Bullock in obtaining parental consent for duct ligation in one of their patients, which operation was also successful. Then other parents, previously held back by untried surgical theory, readily consented to proved surgical fact. Since that time over three hundred cases of surgical closure have been reported in the literature.

Before weighing the results of surgical treatment of a patent ductus arteriosus, it is well to recall briefly the prognosis in such cases not treated by operation. In a review of the literature, Shapiro and Keys²⁹ analyzed all the cases of patent ductus arteriosus in adults from which postmortem examinations have been reported. They stated that 80 per cent of such patients eventually succumb to their cardiac lesion. These patients who were alive at seventeen years of age averaged thirty-five years of age at death. At least 40 per cent of these patients died of subacute bacterial endarteritis, and most of the remainder died of congestive cardiac failure. Spontaneous rupture of the pulmonary artery or the ductus occurred in a few cases. The average age of the fifty-one patients of their own series was twenty-five years,

*Presented at the Twelfth Annual Meeting, American College of Chest Physicians, San Francisco, California, June 30, 1946.

and the oldest patient died at fifty-eight. Bullock, Jones, and Dolley¹¹ reporting on eighty cases of patent ductus in patients over the age of three years proved by necropsy to have no other significant cardiac anomaly, presented somewhat similar statistics. Of this group 86 per cent died as the result of the congenital lesion. Fifty-three per cent died of bacterial endarteritis, twenty-three per cent died of congestive failure.

Since in the above mentioned series of untreated cases as much as 40 per cent or more died of bacterial endarteritis it is of special interest to study the progress made by surgical closure of the ductus in such cases. The first surgical cure of subacute bacterial endarteritis involving a patent ductus arteriosus was reported by Touroff and Vessel¹⁶ in 1940. In this and in subsequent reports,^{12,22,23,25} Touroff and his associates have contributed considerable information regarding such cases. Touroff states that in the early stages of infection, vegetations are likely to remain confined to the ductus and pulmonary artery, but in the latter stages of infection, or even in the early stages of severe infection, vegetations may spread to the cardiac valves or into the aorta. Continued presence of the infection increases edema and makes the ductus and the adjacent structures more friable. Because of these facts, the safety and effectiveness of the operation is greatly increased if surgical closure is effected as early as possible after infection is discovered. Shapiro and Keys²⁹ reporting on 140 patients operated upon by a total of twenty-five surgical teams, stated that subacute bacterial endarteritis was present in thirty-three cases. Of these thirty-three, twenty operations resulted in apparent successful cure. Five patients died on the operating table as the result of hemorrhage, and in eight instances the fever persisted in spite of the ligation of the duct. In one of the cases³⁰ in our series the streptococcus viridans disappeared from the blood stream almost immediately following ligation of the ductus and the patient entirely recovered. To date, more than four years after operation, there has been no return of infection. Blalock³⁶ reported on six operations on patients with streptococcus viridans. Four were successful and two died subsequent to discharge from the hospital. Of these two, the lumen of the ductus became reestablished in one. Ziegler³⁸ reported the successful surgical cure of an unusual subacute bacterial endarteritis by ligation in a patient with patent ductus arteriosus complicated by the presence of a patent interventricular septal defect and an anomalous left vena cava. Twenty-six (63 per cent) of these forty-one operations on cases associated with bacterial infection were successful. As is generally known, the mortality rate of untreated cases of subacute bacterial endarteritis is approximately 100 per

cent. Although in some cases of infection encouraging results have been obtained recently by large doses of penicillin,³⁹ chemical therapy alone has not proved effective in cases where the bacterial infection is superimposed on a patent ductus. It is still too early to make a positive statement regarding the permanency of the cure effected by surgical closure of the ductus in such cases, but the results so far are definitely encouraging and, in the face of almost certain death without operation, it would seem that surgical closure should be strongly urged when it is known the infection is present. It is believed that improved operative technique gained through experience has already decreased the likelihood of operative failure in these cases. Johnson et. al.²⁰ suggests an operative technique where the thin-walled ductus creates a hazard of injury to ductus wall, in cases with subacute bacterial endarteritis with implantation in the ductus. A suggested management of a torn ductus arteriosus is also given. It can not yet be stated that ligation of the ductus in non-infected cases will entirely remove the danger of subacute bacterial endarteritis as in two cases infection developed postoperatively. However, it is believed that ligation reduces the probability of this development. As observed by Touroff,²³ the lungs play an important role in removing infective material from the circulating blood of humans and in cases of subacute bacterial endarteritis superimposed on patent ductus arteriosus, infective material enters the peripheral circulation at least in part, through the pulmonary circuit.

The question of suture materials has not yet been definitely established in the minds of surgeons as a whole, nor has the manner of ligation been entirely standardized, although the correct choice of material and method is very important to the success of the operation. Several types of ligatures have been used including linen, cotton, braided silk, and cellophane. Cellophane, alone, has not been favored as it might bring about partial stenosis of the pulmonary artery or the aorta. Wire, very popular in many operations, has not been used because of lack of resiliency, and the constant pulsating of the aorta might result in cutting through the ductus. The umbilical tape ligature of women silk 5/32 inch in breadth, advocated by Mont Reid,⁴ is probably the most frequently used. Several methods of closing the ductus have been used. The method of simple ligation with one ligature is not satisfactory as it leaves one end or the other of the duct open, allowing eddying which might not eliminate the roaring murmur, and would invite subacute streptococcus endocarditis. Also, the ligature may cut through the wall and allow the lumen to become patent again. Humphreys²⁴ reported a case where ligation was made with a single heavy silk ligature and the patency became

reestablished, necessitating a second operation. A double ligature of umbilical tape was used at reoperation. Gross^{7,8} originally used simple ligation, but later supplemented the use of woven silk ligature with the use of a ligature of cellophane, weight 300, of the unsurfaced type, placed over the silk ligatures. Another method used was that of a sclerosing fluid injected into a short segment of the ductus isolated by two ligatures. More recently Gross³¹ has reported a series of 87 cases in which complete surgical division and closure of the patent ductus arteriosus was successfully achieved. He believes this technique is more desirable where conditions indicate that complete division of the vessel can be accomplished. Touroff²² has stated that he found ductal ligation to be similarly effective to ductal division. We feel that cutting of the ductus is objectionable in that it adds somewhat to the gravity of operation with little, if any, benefit over ligation. Blacklock³⁶ has recommended placing one purse string suture flush with the pulmonary artery and one with the aorta, not tied too tightly for fear of cutting through the friable ductus, then two through-and-through mattress sutures of silk are placed and tied between the two purse string sutures. A ligature of umbilical tape is then tied over the mattress sutures of silk. This seems to be one of the most logical methods advocated, provided the ductus is not too short. He suggests that even if division and closure of ductus is the method used, the preliminary placing of purse string sutures at the extreme ends of the ductus would make the procedure less dangerous. In our experience, which is limited to eleven cases, we have used one of the methods first adopted. Two ligatures of braided silk are made, one flush with the aorta and one flush with the pulmonary artery. So far, there have been no bad effects and no reestablishment of the lumen of the ductus has been noted. This procedure is particularly applicable when the ductus is short and dissection and isolation is more difficult.

It is not felt that surgical closure of the patent ductus arteriosus should be indiscriminately advised in all cases, however the hazards of a patent ductus are sufficiently serious and the per cent of successful operations in experienced hands has increased enough that operation is advisable in probably the majority of cases. Gebauer and Nichol¹⁷ have expressed the belief that operation should be performed early because children withstand thoracic surgical procedures so much better than adults, because the operation is technically easier, and because the shorter the duration of patency, the less the degree of pulmonary dilatation, cardiac enlargement, vessel sclerosis, and the less severe the postoperative reaction.

It has long been recognized surgical closure of a patent ductus

would terminate fatally in cases where another abnormality of the heart is present which requires the open ductus as a compensatory mechanism. These cases are usually easily recognizable with careful examination. The function of the patent ductus in such cases was demonstrated recently by the interesting work of Blalock in case of partial stenosis of pulmonary artery in which he creates what might be called an artificial patent ductus arteriosus by anastomosing the innominate or subclavian artery to the pulmonary artery to divert the blood of the aorta to pulmonary artery, which is what occurs when ductus arteriosus remains patent. In this connection it would be interesting to note whether his cases will in time develop bacterial endarteritis. It would seem that large doses of penicillin should be administered immediately.

Ziegler³⁸ observes that it is generally agreed that the absence of typical murmurs constitutes a contraindication to surgical intervention in cases of suspected patent ductus arteriosus, but since typical murmurs are absent in nearly a third of the cases and the incidence of subacute bacterial endarteritis ranges as high as 50 per cent, a decision in favor of surgery may be advised in such cases if the infectious agent is resistant to sulfonamides or penicillin, and of course, provided no other congenital defect is present which requires the patent ductus as a compensatory mechanism.

In our series of eleven cases, there were ten successful surgical ligations and one death from an associated interventricular defect. Of the ten successful operations, there were eight uncomplicated cases, one with streptococcus viridans infection, and one with an aneurysm of the pulmonary artery. It is interesting to note that although patent ductus arteriosus is not essentially a common vascular defect, two of the children of our series were first cousins with the same surname and approximately the same age.

At the end of five years we find general improvement in our patient's conditions. They are better developed and well nourished. One girl who had not menstruated, though beyond the normal age, has now started her regular periods.

COMMENT

Judging from our own experience and from a review of the cases reported in the literature, surgical closure of patent ductus arteriosus can be accepted as a successful means of treatment in a large number of cases. In view of the gratifying results in cases of bacterial endarteritis associated with patent ductus arteriosus, it is felt that surgical closure as soon as possible should be urged in such instances.

COMENTARIO

A juzgar por nuestra propia experiencia y por un repaso de los casos informados en la literatura, el cierre quirúrgico del *ductus arteriosus* abierto puede ser aceptado como un tratamiento satisfactorio en un gran número de casos. En vista de los resultados placenteros obtenidos en casos de endarteritis bacteriana asociada con *ductus arteriosus* abierto, se opina que en estos casos se debe urgir el cierre quirúrgico tan pronto como lo sea posible.

REFERENCES

- 1 Munro, J. C.: "Ligation of Ductus Arteriosus," *Ann. Surg.*, 46:335, 1907.
- 2 Graybiel, A., Strieder, J. W., and Boyer, N. H.: "An Attempt to Obliterate the Patent Ductus Arteriosus in a Patient with Subacute Bacterial Endarteritis," *Am. Heart J.*, 15:621, 1938.
- 3 Dry, D. M.: "Congenital Aneurysmal Dilatation of Ductus Botalli," *Am. J. Dis. Child.*, 22:181, 1921.
- 4 Moench, G. L.: "Aneurysmal Dilatation of the Pulmonary Artery with Patent Ductus Arteriosus," *J.A.M.A.*, 82:1672, 1924.
- 5 Christie, A.: "Normal Closing Time of the Foramen Ovale and the Ductus Arteriosus," *Am. J. Dis. Child.*, 40:323, 1930.
- 6 Gross, R. E., and Hubbard, J. P.: "Surgical Ligation of the Patent Ductus Arteriosus: Report of the First Successful Case," *J.A.M.A.*, 112:729, 1939.
- 7 Gross, R. E.: "A Surgical Approach for Ligation of a Patent Ductus Arteriosus," *New England J. Med.*, 220:510, 1939.
- 8 Gross, R. E.: "Surgical Management of the Patent Ductus Arteriosus," *Ann. Surg.*, 110:321, 1939.
- 9 Jones, J. C., Dolley, F. S., and Bullock, L. T.: "The Diagnosis and Surgical Therapy of Patent Ductus Arteriosus," *J. Thoracic Surg.*, 9:413, 1939.
- 10 Boyd, L. J., and McGavack, T. H.: "Aneurysm of the Pulmonary Artery, A Review of the Literature and Report of Two New Cases," *Am. Heart J.*, 18:562, 1939.
- 11 Bullock, L. T., Jones, J. C., and Dolley, F. S.: "The Diagnosis and Effects of Ligation of the Patent Ductus Arteriosus. A Report of Eleven Cases," *J. Pediat.*, 15:786, 1939.
- 12 Touroff, A. S. W., and Tuchman, L. R.: "Subacute Streptococcus Viridans Endarteritis Superimposed on Patent Ductus Arteriosus; Spontaneous Recovery. Recurrence After Twelve and One-half Years. Recovery Following Operative Treatment," *Am. Heart J.*, 23:857, 1940.
- 13 Graham, Evarts A.: "Aneurysm of the Ductus Arteriosus, With a Consideration of Its Importance to the Thoracic Surgeon, Report of Two Cases," *Arch. Surg.*, 41:324, 1940.
- 14 Gross, R. E.: "Surgical Closure of the Patent Ductus Arteriosus," *J. Pediat.*, 17:716, 1940.
- 15 Eppinger, E. C., and Burwell, C. S.: "The Mechanical Effects of a Patent Ductus Arteriosus on the Heart," *J.A.M.A.*, 115:1262, 1940.
- 16 Touroff, A. S. W., and Vessell, H.: "Experiences in the Surgical Treatment of Subacute Streptococcus Viridans Endarteritis Complicating Patent Ductus Arteriosus," *J. Thoracic Surg.*, 10:59, 1940.
- 17 Gebauer, P. W., and Nichol, A. D.: "Ligation of the Patent Ductus Arteriosus," *Ohio State M. J.*, 37:538, 1941.
- 18 Eppinger, E. C., Burwell, C. S., and Gross, R. E.: "The Effects of the Patent Ductus Arteriosus on the Circulation," *J. Clin. Investigation*, 20:127, 1941.
- 19 Miangolorra, C. J., and Hull, E.: "Successful Ligation of a Patent Ductus Arteriosus," *Surgery*, 9:597, 1941.

- 20 Johnson, J., Jeffers, W. A., and Margolies, A. L.: "The Technique of the Ligation of the Patent Ductus Arteriosus," *J. Thoracic Surg.*, 11: 346, 1942.
- 21 Nixon, J. W.: "Ligation of a Patent Ductus Arteriosus: Report of A Successful Case," *Surgery*, 12:31, 1942.
- 22 Touroff, A. S. W.: "Further Experiences in the Surgical Treatment of Subacute Streptococcus Viridans Endarteritis Superimposed on Patent Ductus Arteriosus," *J. Thoracic Surg.*, 12:1, 1942.
- 23 Touroff, A. S. W.: "Blood Cultures from Pulmonary Artery and Aorta in Patent with Infected Patent Ductus Arteriosus," *Proc. Soc. Exper. Biol. and Med.*, 49:568, 1942.
- 24 Humphreys, G. H.: "Ligation of the Patent Ductus Arteriosus. A Report of the Results in Seven Cases," *Surgery*, 12:841, 1942.
- 25 Touroff, A. S. W.: "The Results of Surgical Treatment of Patency of the Ductus Arteriosus Complicated by Subacute Bacterial Endarteritis," *Am. Heart J.*, 25:187, 1943.
- 26 Keys, A., and Shapiro, M. J.: "Patency of the Ductus Arteriosus in Adults," *Am. Heart J.*, 25:158, 1943.
- 27 Mackler, S., and Graham, E. A.: "Aneurysm of the Ductus Botalli as a Surgical Problem," *J. Thoracic Surg.*, 12:719, 1943.
- 28 Harrington, S. W.: "Patent Ductus Arteriosus with Bacterial Endarteritis: Transpleural Ligation through Posterolateral Approach: Report of A Case," *Proc. Staff Meet., Mayo Clin.*, 18:217, 1943.
- 29 Shapiro, M. J., and Keys, A.: "The Prognosis of Untreated Patent Ductus Arteriosus and the Results of Surgical Intervention. A Clinical Series of 50 Cases and an Analysis of 139 Operations," *Am. J. Med. Sc.*, 206:174, 1943.
- 30 Nixon, J. W., Bondurant, W. W. Jr., and Roan, O.: "Ligation of a Patent Ductus Arteriosus with Probable Endarteritis: Apparent Cure," *Ann. Int. Med.*, 19:1003, 1943.
- 31 Gross, R. E.: "Complete Surgical Division of the Patent Ductus Arteriosus; A Report of Fourteen Successful Cases," *Surg., Gynec. and Obst.*, 78:36, 1944.
- 32 Burch, G. E.: "Congenital Patent Ductus Arteriosus: An Evaluation of Its Surgical Treatment," *Med. Clin. of N. A.*, 388, March 1944.
- 33 Nixon, J. W.: "Surgical Ligation of a Patent Ductus Arteriosus Associated with an Aneurysm of the Pulmonary Artery," *J. Thoracic Surg.*, 13:513, 1944.
- 34 Winsor, T., and Burch, G. E.: "Congenital Patent Ductus Arteriosus: A Therapeutically Reversible Type of Heart Disease," *Southern M. J.*, 38:132, 1945.
- 35 Blalock, A., and Taussig, H. B.: "The Surgical Treatment of Malformations of the Heart in Which there is Pulmonary Stenosis or Pulmonary Atresia," *J.A.M.A.*, 128:189, 1945.
- 36 Blalock, A.: "Operative Closure of the Patent Ductus Arteriosus," *Surg., Gynec. and Obst.*, 82:113, 1946.
- 37 Fagin, I. D., Sheppard, W. L., and Morrison, A. T.: "Coarctation of the Aorta, Patent Ductus Arteriosus and Interventricular Septal Defect. Report of a Case," *Texas State J. Med.*, 41:515, 1946.
- 38 Ziegler, R. F.: "The Cure of Subacute Bacterial Endarteritis by Surgical Ligation in a Patient with Patent Ductus Arteriosus Complicated by the Presence of Multiple Congenital Cardiac Defects," *Am. Heart J.*, 31:231, 1946.
- 39 Editorial (H. H. H.): "Present Status of Treatment of Subacute Bacterial Endocarditis," 15: Feb., 1946.
- 40 Dolley, F. S.: "Discussion," See 9.
- 41 Reid, Mont.: "The Ligation of Large Arteries," *Surg., Gynec. and Obst.*, 58:287, 1934.

Discussion

O. C. BRANTIGAN, M.D., F.C.C.P.
Baltimore, Maryland

The subject has been admirably covered by Dr. Nixon. Eight years of experience and study of patent ductus arteriosus has brought about unanimity of opinion on most of the problems that first confronted the surgeon. Two important problems are not yet completely settled; the indication for surgery and the type of surgical treatment. It appears that in infants and children operation gives the best chance for longevity and therefore is always indicated since the surgical mortality and morbidity are so low. However, when the condition is accidentally discovered in an adult, perhaps it is best to withhold surgery unless definite symptoms are present. In treatment it seems that the trend is toward division of the ductus rather than ligation. However, one must concede that when either method is adequately accomplished, the results appear to be equally good.

I would like to complicate the diagnostic problem by presenting a case of a young colored adult, male, diagnosed as patent ductus arteriosus. At operation all the findings of a patent ductus arteriosus were present except the ductus itself. The aorta was normal, the pulmonary artery dilated and it presented the typical thrill. Demonstration of the ligamentum arteriosum was necessary to rule out the presence of a patent ductus. Approximately one year later at autopsy a communication between the aorta and pulmonary artery was demonstrated just distal to competent aortic and pulmonic valves. When there is aorto-pulmonic communication caused by rupture of a syphilitic aneurysm or from rupture of a congenital aortic septal defect, there is a sudden onset of acute symptoms and therefore, it cannot be confused with patent ductus arteriosus. If there is a congenital aorto-pulmonic communication without other cardiac or vascular anomalies as in the patient described, the symptoms and findings will be indistinguishable from the symptoms and findings of patent ductus arteriosus. The patient described had a positive Wassermann reaction and microscopically a syphilitic aortitis, apparently superimposed upon a congenital anomaly. The communication grossly seemed congenital and there was no history of sudden acute onset of symptoms suggesting a perforation of an aneurysm, either syphilitic or congenital.

Hazards of Bovine Tuberculosis as a Matter of Public Health Significance and Potential Human Lung Infections with Bovine Tubercle Bacilli

H. M. O'REAR, D.V.M.*

Sacramento, California

Following discovery of the tubercle bacilli by Professor Koch, three types of the organisms were soon recognized immunologically as separate and distinct entities, i.e., the human, bovine and avian. For several years thereafter, Koch, as well as many other reputable scientists in the field of bacteriology, contended that the host-species in each category would not contract tuberculosis when exposed to other types of the bacilli and, therefore, bovine tuberculosis was not transmissible to man. However, that conclusion was later exploded and Koch, after much reluctance, finally changed his former opinion in the premise. Consequently, the transmission of tuberculosis from animal to man soon became a generally accepted fact but not without reservations as to its clinical effects. A consensus prevailed that, although transmissible to man, the condition produced by the bovine tubercle bacilli was confined mainly to certain circumscribed limitations such as glandular or lymph node infections and tuberculosis of the bone and joints, but it was not considered to be more than passively capable of producing pulmonary lesions of tuberculosis. With the development of better methods and more practical means of typing, greater stress in recent years has been attached to the importance and desirability of identifying the type of bacilli actually responsible for the disease when it occurs in man. Today bovine bacilli stand convicted not only as the causative agent of a variety of clinical forms, including progressive tuberculosis in man, but pulmonary tuberculosis of bovine origin has been established either clinically or on necropsy in an increasing number of human cases, particularly in European countries where bovine tuberculosis flourishes to a much greater extent among cattle at the present time. Also an increasing number of generalized cases of tuberculosis in humans attributed to the bovine bacilli have been reported in several of these countries.

*Inspector in Charge, U. S. Bureau of Animal Industry, Sacramento, California. Presented at the 12th Annual Meeting of the American College of Chest Physicians, San Francisco, California, June 28, 1946.

Jordan, states "that no less than 30 per cent of the cattle in England are affected with tuberculosis. In England 5.2 per cent of all deaths in man due to tuberculosis are the result of the bovine tubercle bacilli and 25 per cent of the deaths from non-pulmonary tuberculosis are due to the bovine tubercle. Milk samples from various cities show virulent tubercle bacilli in from 2.9 to 11.1 per cent."

Lobesian, Jansen and Lossen, reported recovering bovine tubercle bacilli from 26 cases of pulmonary tuberculosis in man in Copenhagen, Denmark.

W. T. Monroe and H. Scott, writing on the subject of human and bovine type meningeal tuberculosis in Scotland, reported "50 cases, 14 at the Glenomen Sanitarium, 7 of which were human and 7 were bovine; while in 36 cases at the Royal Infirmary Dundee, 25 were human and 11 were bovine." Continuing, the authors state "it is noteworthy to mention that 55 per cent of the bovine cases were in infants and children under five years of age."

A. Stanley Griffith presents the following: "The British Royal Commission on Tuberculosis in 1907 found that cow's milk containing bovine tubercle bacilli is clearly a cause of tuberculosis and fatal tuberculosis in man. Our results clearly point to the necessity of means, more stringent than those at present enforced, being taken to prevent the sale and consumption of such milk. Twenty-five years have passed and the country still has a milk supply infected with tubercle bacilli to such an extent that often from 5 to 12 per cent and more of samples of ordinary churned milk contained tubercle bacilli and more than one-third of the cows in this country are tuberculous." He further states, and quotes figures in reporting on milk in London, south of England and northeast Scotland as follows: "It is impossible to compute how many people have died from infection with the bovine tubercle bacillus since 1911, or what it has cost or is costing in providing institutional treatment for crippled and in other ways incapacitated human beings. When to all of this are added the economic losses from bovine tuberculosis among animals, the tribute paid to the bovine bacillus must be enormous. Since 1911 a number of type demonstrations have been made and the proportional frequency of human and bovine types of bacilli in the different varieties of tuberculosis have been determined and show that all varieties of the disease may be caused by the bovine bacillus.

"In spite of all the evidence," he continues, "which has been accumulated from 1911 onwards on the danger of tubercle bacilli infected milk, the chief administrative measures in this country for the control and prevention of bovine tuberculosis in animals and man are the slaughter of cattle only when they have done

untold mischief, and by clinical veterinary inspections, not by any means general, which may eliminate the dangerous animals a little sooner than other would be the case but will never lead to the eradication or even a noticeable diminution in the incidence of the disease."

In their report Griffith and Munny summarize the results of the investigation of 6,963 cases of pulmonary tuberculosis in Great Britain. Out of 2,769 cases in Scotland, 160 yielded strains of bovine type. Out of 3,671 cases in England, 79 were found to be of bovine type. The proportional frequencies of the bovine infection were higher in all regions in Scotland than in England, the percentage being highest in Orkney Islands, 25.8 per cent; rural districts in the mainland of northeastern Scotland, 9.1 per cent; rural districts of the rest of Scotland, 5.2 per cent; north and middle England, 2 per cent; and northern England, only 0.6 per cent. "The anatomical evidence, previous cervical and abdominal glandular and bone and joint tuberculosis, in about one-third of the cases in Scotland and one-fourth of those in England, strongly suggest the digestive tract as the channel of entry for the bacilli."

Pulmonary tuberculosis of bovine origin is summarized by Cut-

ENGLAND STATISTICS

Number of Cases	Per cent
126 Cervical Glands	50 Bovine type
191 Lupus	48.7 Bovine type
60 Scrofulderma	36.8 Bovine type
553 Joint and Bone cases	19.5 Bovine type
23 Genito-Urinary	17.4 Bovine type
265 Meningeal cases	24.6 Bovine type
187 Necropsies	22.5 Bovine type
23 Miscellaneous	8.7 Bovine type

SCOTLAND STATISTICS

Number of Cases	Per cent
93 Cervical Glands	51.6 Bovine type
13 Lupus	69.2 Bovine type
218 Bone and Joint cases	29.8 Bovine type
42 Genito-Urinary	31 Bovine type
203 Meningeal cases	29.6 Bovine type
290 Necropsies	32.4 Bovine type
14 Miscellaneous	71.4 Bovine type

bill and Allen as follows: "The number of cases of pulmonary tuberculosis due to the bovine type bacilli among 2,101 cases in a sanatorium was 48, or 2.28 per cent, the highest so far recorded in England. In 16 of these cases, infection most probably occurred from milk and in 19 cases no direct evidence of any source of infection was found, although milk-borne infection could not be excluded. Evidence of infection by direct contact with cattle was strongly suggested in 10 cases. Details are given of three families in each of which two members were found to have pulmonary tuberculosis of bovine origin. The original source of infection in each family was probably contact with tuberculous cattle and the subsequent infection of the other member probably due to human transmission of bacilli of the bovine type."

Considering for a moment other aspects in regard to the matter of transmission, swine are ordinarily highly susceptible to the bovine tubercle bacilli and are infected quite readily when exposed under natural conditions that exist on the average farm in the corn belt of the Middle West. Swine are susceptible also to the avian tubercle bacillus, but here again, a generally accepted opinion prevailed that, although swine were subject to infections by the avian bacilli, the disease was confined almost entirely to lymph nodes of the alimentary system; the disease rarely, if ever, became progressive in swine and, therefore, was of little consequence. As a result of this accepted opinion, it was generally assumed that the elimination of tuberculosis in cattle would automatically eliminate the disease in swine insofar as tuberculosis was concerned as an economical factor in the marketing of these animals. By the late 1920's, retentions and condemnation of swine carcasses in packing establishments maintaining Federal inspection in the Middle Western states reached a point where the situation was viewed by packers and the livestock industry with considerable apprehension. Finally, the large slaughtering establishments that formulate the meat packers' institute agreed to pay farmers and shippers of swine a premium of ten cents per cwt. for swine shipped direct to them from modified, accredited counties. The reasoning back of this movement was not founded entirely upon eleemosynary tendencies but was offered mainly as a means of stimulating interest among swine breeders and feeders in support of the county area tuberculosis eradication program in their respective counties. Thus it was believed that, by increasing these activities, it would serve a two-fold purpose: first, it would hasten the accreditation of counties and, since the incidence of bovine tuberculosis must be reduced to less than 0.5 per cent among cattle in such counties to become accredited, the losses in connection with the slaughter of cattle from such counties would be

materially reduced; second, progressive tuberculosis resulting in the high condemnation of swine at slaughter was due to bovine tuberculosis contracted by exposure to tuberculous cattle and therefore, this would, in turn, solve the problem of losses confronted on account of tuberculosis in swine. While it was hoped that this inducement would serve a dual purpose, the paramount reason for this gesture on the part of the packers' institute was ostensibly to reduce the economic losses in the slaughter of swine infected with tuberculosis. During the 3 years of this procedure, approximately \$3,000,000.00 was paid in premiums to the shippers of slaughtered swine from modified, accredited areas. After what was considered a reasonable trial period, it was discovered that retentions and the condemnations of swine at slaughter were continuing at a rate that was out of proportion to the incidence of tuberculosis in cattle in accredited counties. It could hardly be reasoned that porcine breeding stock infected from previous exposure to tuberculous cattle in those areas were still responsible for perpetuating the disease among slaughter swine to such an extent. Although Van Es and others, including veterinarians in the Bureau had devoted considerable time, over a period of years, to the study of various phases of the avian tuberculosis situation, this state of affairs attracted the attention of Feldman at the Mayo Foundation in Rochester, Minnesota. In 1936, he reported the results of a study of 30 specimens of lesions which were obtained from swine condemned on account of tuberculosis at an abattoir in southeastern Minnesota, in which 24 of 30 cases were found to be due to the avian tubercle bacilli. As a result of this rather startling disclosure, the Bureau of Animal Industry conducted a similar study at its animal disease station in Beltsville, Maryland, and was able to confirm the findings reported by Feldman. It is now generally conceded that a high percentage of condemnations on account of tuberculosis in swine slaughtered at packing centers in the Middle Western area is a result of the avian tubercle bacilli. While avian tuberculosis is not considered to be more than remotely infectious for man, it is quite apparent now that conclusions regarding the ability of the avian type of bacilli to produce progressive tuberculosis in swine were evidently based upon information involving too few cases and resulted from a lack of adequate investigation. By the same token, human tuberculosis was not considered pathogenic for cattle until recently. It was generally recognized that cattle exposed to the human bacilli would develop a sensitization to tuberculin which would cause positive reactions, but this was viewed largely as a transitory condition and little significance was attached to the human bacilli as a matter of concern in cattle other than the confusion which it caused in

the interpretation of the tuberculin test, a condition which must of necessity be tolerated for the lack of a practical test possessed with greater specificity than tuberculin. It was a generally recognized fact that human beings who were discharging bovine tubercle bacilli from open lesions would readily infect cattle that were exposed to such contaminant, but for all general purposes it was thought that the human bacilli had little or no ill effect on cattle other than this particular undesirable influence which it exerted on the tuberculin test. Although long suspected by those directly engaged in the field of bovine tuberculosis eradication, the transmission of the disease and the fact that human tubercle bacilli will cause pathological lesions of tuberculosis in cattle are matters of relatively recent acceptance. At times different research workers have paused to consider the matter of mutation as a potential possibility under certain favorable conditions but this is still regarded, more or less, as a problematical phenomenon. However, there are those engaged in field activities who have witnessed conditions that strongly suggest such possibility and, in view of some of the beliefs concerning transmission which have been found to be erroneous during the present generation, further prosecution of this phase might lead to some similar situation.

In order to epitomize the subject, bovine tuberculosis should probably be referred to as a disease that commonly affects cattle and swine, is transmissible to certain other domestic animals, only to a slightly lesser degree, is infectious for some species of mammalian wild life, and one to which man himself is also susceptible. Therefore, in effect, the disease is not alone a matter of economic importance in the production of dairy and breeding cattle and to the swine industry, but is also a question of public health significance.

By virtue of this fact, a program was inaugurated in the United States in 1917 which had for its objective the ultimate eradication of bovine tuberculosis. This enterprise was inspired and fostered by various individuals and groups and the movement was launched in face of what appeared to many to be a humanly impossible task that would only result in a waste of time, effort and money. A larger portion of the support behind this task came from those who were directly connected or closely affiliated with the livestock industry and others with allied interests, although there were still others less directly concerned who were intensely interested and displayed much enthusiasm in the enterprise. The optimism that prevailed among the various individuals that composed this group of pioneers is responsible in a large measure for the success thus far attained. The disease incidence among dairy and breeding cattle in this country at that time was estimated

at approximately 4.2 per cent with the greater portion of these diseased animals being located in the milk sheds that supply the large metropolitan areas with milk and its by-products for human consumption. The mean average for the dairy and breeding cattle population in this country during the past twenty-five years approximates about 63,000,000 animals. Thus far, in the conquest of bovine tuberculosis, approximately 279,500,000 tuberculin tests have been applied in more than 22,000,000 lots of animals scattered throughout the nation and have resulted in the condemnation of about 3,892,000 animals that revealed positive reactions to these tests. The peak of activities in this campaign was reached in the fiscal year of 1935, and during that year, 25,237,532 animals were subjected to tuberculin tests, resulting in the condemnation of 376,623 animals that gave positive reactions to these tests. Since that year, there has been a gradual decline in the number of cattle tested annually, due in part to the man power shortage caused by the war, but mainly as a result of the continued lowering of the disease incidence, thereby reducing the frequencies of tests necessarily required to preserve the situation during the control era. Only 19,534 positive reactor animals were slaughtered in the entire United States during the fiscal year of 1945, which is quite a contrast to the number disclosed ten years previous and is equivalent to only about 0.03 per cent of the entire dairy and breeding cattle population of the country.

The uniform methods and rules adopted shortly after the cooperative bovine tuberculosis eradication project was inaugurated provided that, when the incidence of bovine tuberculosis had been reduced to 0.5 per cent as a result of the actual tuberculin testing of all dairy and breeding cattle within its borders followed by the immediate slaughter of all positive reactors, the county as a unit would then be designated by the U. S. Bureau of Animal Industry and the cooperating State Department in the state where such county was located as a modified, accredited area for a period of three years. A somewhat similar procedure was also provided for the re-accreditation of such counties upon termination of the three-year period. There are 3,069 counties in the United States, and the last one of these was accredited in November, 1940, approximately twenty-three years after the project was undertaken and, incidentally, that county is located in the state of California. Consequently, all states, including the municipalities of Puerto Rico and the Virgin Islands, now enjoy the distinction of this classification by virtue of the fact that all areas within their borders are modified, accredited areas.

Professor H. R. Smith, general manager, National Livestock Loss Prevention Board, presents the following under the caption "Bo-

vine Tuberculosis Declines 98 per cent:" "The Federal meat inspection records, which give us a true picture of conditions, show that in 1916, the year before the national tuberculosis eradication campaign was started, 2.35 per cent of all cattle slaughtered had tuberculous lesions, as compared to 0.96 per cent in 1908, increasing two and one-half times in the eight-year period. If nothing had been done and if it had continued at the same rate to the present time, today, 50 per cent of our cattle would be infected with the disease. But the situation was brought to the attention of legislative bodies and something was done. With adequate appropriations from Congress, State legislators and county boards, and with an efficient army of veterinarians ably directed by Federal and State sanitary officials, tuberculin testing was done so thoroughly that, by 1943, only .048 per cent of all cattle slaughtered under Federal inspection showed lesions and were retained for the disease—a reduction of 98 per cent from the 1916 figure. The number of beef carcasses condemned has been reduced from 40,746 in 1917 or 0.43 per cent of the total killed to 1,248 or 0.01 per cent in 1943, also a reduction of 98 per cent. In Chicago the reductions have been 99 per cent in each case." A further reduction in both retentions and condemnations is reflected in the percentage figures for the fiscal year 1945, which reveal but .04 per cent of the animals slaughtered under Federal inspection during the year were retained for tuberculosis and only .009 per cent of these were condemned.

Again Professor H. R. Smith, states: "Since 1917, with the gradual removal of nearly all tuberculous cattle, there has been a constant decrease in the tuberculosis death rate among humans in the United States from 22.5 to 3.5 in 1942 (84 per cent). During the same period, there was a decrease of 68 per cent in the human death rate from respiratory tuberculosis."

Unfortunately, statistical data on typing during the greater part of this period are not of sufficient volume to determine the extent that bovine tuberculosis eradication actually played in this very gratifying reduction in the human death rate. Therefore, conclusions in this respect are for the most part based upon circumstantial evidence which, of course, presents a matter of conjecture, but it is believed with all candor that achievements attained in this project have been a contributing factor of more than meager proportion.

The U. S. Bureau of Animal Industry, in a release issued by the Department of Agriculture through the USDA Publication, January 7, 1946, estimates "that nearly 40,000 animals or sixteen million pounds of beef a year, which would otherwise have been condemned as unfit for human consumption, are saved as a result

of the bovine tuberculosis eradication campaign. During the last fiscal year (1945) about fourteen and one-half million cattle, exclusive of known reactors, were slaughtered under Federal inspection. Only 0.04 per cent were found to be tuberculous and only one in 10,000 was sufficiently infected to warrant condemnation. But when the campaign began, condemnations were thirty times as frequent. Meat inspection and livestock shipping records are of value in tracing tuberculous cattle to their home premises, in order that any remaining infected cattle may be eliminated. Although our cattle as a whole are now remarkably free from the disease which troubles the livestock industry of many other countries, unsuspected centers of infection are frequently found. But the vast saving in beef has paid for the eradication campaign many times over, not to mention the far safer milk supply we secure as a dividend."

Although bovine tuberculosis is now at low ebb among cattle in the United States, this should not be construed to mean that all danger therefrom to man, cattle, or any other mammalian species is non-existent. An occasional focus of infection is disclosed and frequently a number of animals in a single unit or individual herd are found diseased. Even though dwarfed by percentage terms when applied to the cattle population of the county, state or nation as a whole, yet such animals serve as a potential dangerous element to those in direct contact, in addition to those less directly connected, who may consume milk or its by-products that have not been rendered safe.

In conclusion, it appears obvious that we have arrived at a point in this country when the dissemination of bovine tuberculosis is no longer a matter of serious concern. Sporadic cases of the disease will inevitably occur in mammals from time to time, be they man or animal, until the disease is finally extirpated. It may also be postulated that a definite challenge may now be encountered toward any further appreciable reduction in the incidence of tuberculosis in cattle, so long as tuberculosis exists in any form to plague human or animal life.

Dr. A. E. Wight, who at that time directed tuberculosis eradication in livestock for the Federal Bureau of Animal Industry, says: "Now that tuberculosis in cattle has been reduced to a small fraction of 1 per cent as a result of the systematic Federal-State campaign of eradication, veterinary officials are concerned about the danger of tuberculosis-free herds becoming re-infected. One way that this can happen is from persons who have pulmonary tuberculosis, present evidence indicates." A case is cited in which four herds of cattle were infected by one person. Because of this danger,

he urges close cooperation between public health officials and veterinarians engaged in bovine tuberculosis eradication.

It is also probable that, when more data are available in countries where bovine tuberculosis is much more prevalent today, in view of a greater tendency for typing, plus the effects of a prolonged war, human tuberculosis in all clinical varieties, including pulmonary tuberculosis caused by the bovine tubercle bacilli, will reveal a very conspicuous increase. This potential reflects not alone the extremely favorable situation for those fortunate enough to live in the United States but also the eminence attained by this country in the field of tuberculosis eradication in cattle, an achievement not emulated by any other country and one to which we point with scintillating pride as reminiscent of the fact that bovine tuberculosis is a constant menace to human health, life and general welfare; it is economically destructive and insidious, yet a disease possible of eradication.

*Appreciation is expressed to Dr. A. B. Crawford, superintendent, Animal Disease Station, U. S. Bureau of Animal Industry, Beltsville, Maryland, for assistance rendered in supplying some of the references used.

SUMMARY

Following discovery of the tubercle bacilli by Professor Koch, three types of the organism were soon recognized immunologically as separate and distinct entities, i.e., the human, bovine and avian. For several years thereafter, Koch, as well as many other reputable scientists in the field of bacteriology, contended that host-species in each category would not contract tuberculosis when exposed to other types of the bacilli and, therefore, bovine tuberculosis was not transmissible to man. However, that conclusion was later exploded and Koch, after much reluctance, finally changed his former opinion in the premise. Consequently, the transmission of tuberculosis from animal to man soon became a generally accepted fact but not without reservations as to its clinical effects. A consensus of opinion prevailed that, although transmissible to man, the condition produced by the bovine tubercle bacilli was confined mainly to certain circumscribed limitations such as glandular or lymph node infections and tuberculosis of the bone and joints, but it was not considered to be more than passively capable of producing pulmonary lesions of tuberculosis. With the development of better methods and more practical means of typing, greater stress in recent years has been attached to the importance and desirability of identifying the type of bacilli actually responsible for the disease when it occurs in man. Today the bovine bacilli stand convicted not only as the causative agent of a variety of clinical forms, including progressive tuberculosis in

man, but pulmonary tuberculosis of bovine origin has been established either clinically or on autopsy in an increasing number of human cases, particularly in European countries where tuberculosis flourishes to a much greater extent among cattle at the present time. Also an increasing number of generalized cases of tuberculosis in humans attributed to the bovine bacilli have been reported in several of these countries.

Thus far in the conquest of bovine tuberculosis, approximately 279,500,000 tuberculin tests have been applied in more than 22,000,000 lots of cattle scattered through the United States, resulting in the condemnation and slaughter of approximately 3,892,000 animals that revealed positive reactions to these tests. Following this systematic process of tuberculin testing of cattle at regular intervals since the inauguration of the eradication project in 1917, the incidence of the disease has been reduced to 0.5 per cent in all of the 3,069 counties in the United States and all municipalities in Puerto Rico and the Virgin Islands, and these states and municipalities have enjoyed the distinctive classification of officially modified accredited areas since November 1, 1940. During the fiscal year 1945 about fourteen and one-half million cattle, exclusive of known reactors, were slaughtered under Federal meat inspection. Only 0.04 per cent were found to be tuberculous and only one in 10,000 was sufficiently infected to warrant condemnation.

Therefore, it appears obvious that we have arrived at a point in this country when the dissemination of bovine tuberculosis is no longer a matter of serious concern. Sporadic cases of the disease will occur in mammals from time to time, be they animal or man, until the disease is finally extirpated. It may also be postulated that a definite challenge may now be encountered toward any further appreciable reduction in the incidence of tuberculosis in cattle so long as tuberculosis exists in any form to plague human or animal life.

It is probable, when more data is available in countries where bovine tuberculosis is prevalent to a considerably greater extent among cattle today, in view of a greater tendency toward typing, plus the effects of a prolonged war, that human tuberculosis in all clinical varieties, including pulmonary tuberculosis caused by the bovine tubercle bacilli, will reveal a very conspicuous increase. This potential reflects not alone the extremely favorable situation for those fortunate enough to live in the United States but also the eminence attained by this country in the field of tuberculosis eradication among cattle, an achievement not emulated by any other country, and one to which we point with scintillating pride as reminiscent of the fact that bovine tuberculosis is a constant menace to human health, life and general welfare and, although

economically destructive and insidious, yet, a disease possible of eradication.

RESUMEN

Pronto después del descubrimiento del bacilo tuberculoso por el Profesor Koch, se reconocieron tres tipos del organismo como entidades separadas y distintas, desde el punto de visto inmunológico, a saber: el humano, el bovino y el de las aves. Durante varios años, Koch, lo mismo que muchos otros hombres de ciencia prominentes en el campo de la bacteriología, afirmaron que la especie-huésped en cada categoría no contraería tuberculosis como resultado de su exposición a otros tipos del bacilo y, por consiguiente, que la tuberculosis bovina no podía ser transmitida al hombre. Sin embargo, esa conclusión fue refutada más tarde y Koch, aunque con mucha reserva, cambió por fin su opinión anterior sobre este punto. Consiguientemente, la transmisión de la tuberculosis del animal al hombre pronto llegó a ser un hecho generalmente aceptado, aunque con ciertas restricciones en cuanto a sus efectos clínicos. Prevalció la opinión colectiva de que, aunque transmisible al hombre, la condición causada por el bacilo de la tuberculosis bovina estaba confinada principalmente dentro de ciertos límites circunscritos, tales como las infecciones glandulares y de los ganglios linfáticos y la tuberculosis de los huesos y las articulaciones; pero se consideraba que no era capaz de producir, sino pasivamente, lesiones pulmonares de tuberculosis. Con el desarrollo de mejores técnicas y de medidas más prácticas para determinar el tipo, en los últimos años se ha insistido más sobre la importancia y conveniencia de identificar el tipo de los bacilos que son realmente responsables por la enfermedad cuando ocurre en el hombre. Al presente se condena a los bacilos bovinos no solamente como agentes causales de una variedad de formas clínicas, inclusive de la tuberculosis progresiva en el hombre, sino que se ha establecido el diagnóstico de tuberculosis pulmonar de origen bovino, ya clínicamente o por autopsias, en un número creciente de casos humanos, particularmente en países europeos, donde la tuberculosis es actualmente mucho más común en el ganado. En algunos de estos países se han presentado también informes relativos a un número creciente de casos de tuberculosis generalizada en seres humanos imputable a los bacilos bovinos.

En la conquista de la tuberculosis bovina se han llevado a cabo, hasta ahora, aproximadamente 279,500,000 pruebas a tuberculina en más de 22,000,000 de lotes de ganado esparcidos a través de los Estados Unidos, lo que ha resultado en la condenación y matanza de aproximadamente 3,892,000 animales que revelaron reacciones positivas a estas pruebas. Subsiguiente a este proceso sistemático de comprobar con tuberculina al ganado con intervalos regulares

desde la inauguración del proyecto de erradicación en 1917, se ha reducido la frecuencia de la enfermedad al 0.5 por ciento en todos los 3,069 Condados de los Estados Unidos y todas las municipalidades de Puerto Rico y las Islas Vírgenes, y estos Estados y municipalidades han merecido, desde el 1º de Noviembre de 1940, la distinguida clasificación oficial de zonas autorizadas modificadas. Durante el año fiscal de 1945 se mató, bajo inspección Federal de carne, catorce y medio millones de reses, exclusive de reactores conocidos. Se descubrió que sólo el 0.04 por ciento eran tuberculosas, y solamente una en 10,000 estaba lo suficiente infectada para justificar su condenación.

Por consiguiente, parece evidente que en este país hemos llegado al punto en que la diseminación de la tuberculosis bovina no es ya una cuestión de gran importancia. De cuando en cuando ocurrirán casos esporádicos de la enfermedad en mamíferos, sean ya animales o seres humanos, hasta que sea extirpada finalmente la enfermedad. Se puede postular también que, de aquí en adelante, podrá encontrarse gran dificultad en reducir apreciablemente la frecuencia de la tuberculosis en el ganado mientras exista tuberculosis en cualquiera forma para infectar al hombre o a los animales.

En vista de la mayor tendencia a determinar el tipo ahora, y de los efectos de una guerra prolongada, es probable que cuando se obtenga más datos de países donde la tuberculosis bovina prevalece hoy en sumo grado entre el ganado, se revelará un aumento muy conspicuo de la tuberculosis humana en todas sus variedades clínicas, inclusive de la tuberculosis pulmonar causada por los bacilos de la tuberculosis bovina. Esta posibilidad refleja no solamente la situación, en extremo favorable, de las personas que tienen la buena suerte de vivir en los Estados Unidos, sino también la eminencia alcanzada por este país en el campo de la erradicación de la tuberculosis entre el ganado, hazaña ésta que no ha sido emulada por ningún otro país, y que la presentamos con orgullo centelleante como recordativa del hecho de que la tuberculosis bovina es una amenaza constante a la salud, vida y bienestar general humanos y de que, aunque económicamente destructiva e insidiosa, es, sin embargo, una enfermedad posible de erradicar.

REFERENCES

- 1 Jordan, L.: *Med. Research Council of Privy Council Special Report*, Series No. 4, (England) 184, 1933.
- 2 Tobiesen, F., Jensen, K. A., and Lassen, H. C. A.: "Bovine Pulmonary Tuberculosis in Man," *Tubercle*, 16:385, 1935.
- 3 Monroe, W. T., and Scott, H.: "Human and bovine type Meningeal tuberculosis in Scotland," *Lancet*, Feb. 15, 1936.
- 4 Griffith, A. Stanley: "Bovine tuberculosis in man," *Tubercle*, 18:529, 1937.

- 5 Griffith, A. Stanley, and Munry, W. T.: "Human Pulmonary Tuberculosis," *Jour. Hygiene*, 43:229, 1944.
- 6 Cutbill, Leslie J., and Lynn, Allen: "Pulmonary Tuberculosis of Bovine Origin," *British Med. Jour.*, 1:283, 1944.
- 7 Smith, H. R.: "Progress in the Eradication of Tuberculosis in Poultry and Swine," *Proceedings of 47th Annual Meeting, U. S. Livestock Sanitary Assn.*, p. 242, 1943.
- 8 Smith, H. R.: "Bovine Tuberculosis in the U. S. Its Conquest and its Effects on Public Health," *Am. Rev. Tuberc.*, 50:520, 1944.
- 9 U. S. Dept. of Agri. (Bi-weekly Publication): "Tuberculosis Campaign Pays," 50:1, 1946.
- 10 Wight, A. E.: "Cattle get Tuberculosis from Men," *U.S.D.A. Summary*, 660-45, 4 (2236), April 12, 1945.

Discussion

KARL H. PFUETZE, M.D., F.C.C.P.

Cannon Falls, Minnesota

Mr. Chairman and members of the College: I would like to compliment Dr. O'Rear on his most interesting information and timely paper. Most physicians are aware in only a vague sort of way of the astounding accomplishment of the veterinarians of the United States in reducing so drastically the incidence of tuberculosis of cattle in this country since 1917. As the statistics clearly show the results obtained during this relatively short period, have been truly remarkable. It has been achieved by the ruthless application of the one sure method of eradicating tuberculosis among domestic animals, i.e. the tuberculin test and the slaughter of the reactors. Considering the results obtained, the cost has not been excessive, approximately 250 million dollars. That the task could be accomplished, provides an amazing example of man's ability to utilize his scientific knowledge to free his environment of formidable and insidious factors that threaten his life and economic well being.

As Dr. O'Rear's paper shows, it is extremely significant that in those countries which have no bovine tuberculosis control program, the incidence of infection among cattle remains very high, and there is a relatively high incidence of infection among humans with the bovine type. The gains made in this country in controlling bovine tuberculosis can be maintained and advanced only by exercising constant vigilance. As long as a single tuberculous animal remains, the possibility of the transmission of the infection to healthy animals and to humans exists, the goal must be complete elimination of the disease.

The splendid accomplishment of the veterinarians thus far, in the program to eradicate bovine tuberculosis, constitutes a magnificent challenge to all physicians and laymen alike, who are

working for the elimination of tuberculosis among humans. We cannot be satisfied with the gains made in the control of human tuberculosis while this disease still remains the number one killer of our people between the ages of fifteen and forty-five years.

Dr. O'Rear has well pointed out the danger to humans of infection from tuberculous cattle. To me, however, the greatest lesson to be learned from his excellent paper is that such an achievement was made possible by means of the simple tuberculin test, plus active cooperation on the part of all agencies concerned, official and unofficial, working with the veterinarians. By all odds, the biggest problem in tuberculosis control among humans is *prevention*. We must prevent the *spread* from infected to non-infected persons. We now have at our disposal, the tools to do the job. By means of mass x-ray surveys, the tuberculin test and careful follow up of contacts of known open cases, we can find the carriers of tuberculosis and isolate them.

It will not be an easy task. It will require a tremendous amount of work and huge sums of money. But the end will justify the effort and expense, both in money and human values, many times over. What the veterinarians have done to control tuberculosis in cattle, we physicians should be able to do in controlling tuberculosis among humans. The late Chester Stewart aptly pointed to the problem at the meeting of the College in Chicago in 1944, when he asked: "Do our calves mean more to us than our children?"

Discussion

J. A. MYERS, M.D., F.C.C.P.

Minneapolis, Minnesota

Dr. O'Rear has presented facts which have never been properly recognized or appreciated by a large bloc of physicians in human medicine, as well as nurses and public health workers in this country. Tuberculosis in man produced by the bovine type of tubercle bacillus is an extremely serious problem wherever the disease has not been controlled among the cattle herds. Other domestic animals, such as dogs, cats, horses, sheep, swine and even parrots, develop tuberculosis from the bovine type of bacillus and may transmit it to man. Ever since the world's first school of veterinary medicine was established at Lyons, France in 1762, veterinarians have strived to control tuberculosis among cattle. They have always given two reasons for the necessity of control: first, that the disease is contagious to man and, second, that it constitutes a serious economic problem.

Large numbers of physicians of human medicine long opposed the belief that tuberculosis in cattle is transmissible to man. Indeed, Koch himself stoutly maintained that there was not a bovine type of tubercle bacillus until Smith proved its existence. Then he insisted that the bovine type is not pathogenic for man, even though Ravenel isolated it from tuberculous lesions in humans first in 1902. As late as 1908 he said that bacilli of the bovine type can occur in man, but with few exceptions they are but slightly virulent and remain localized. This view was accepted by many physicians who added to it the belief that the bovine type of tubercle bacillus results in immunity to the human type of organism, and therefore they opposed the veterinarians' eradication program on the grounds that the bovine type of bacillus should be present in dairy products in order that children might be immunized. This view was rather generally accepted although there was no scientific evidence that dependable immunity develops in the human body from any type of tubercle bacillus, and thus eradication of tuberculosis among the cattle herds of this country was definitely retarded. However, such physicians as M. P. Ravenel, Charles H. Mayo, W. H. Park and D. C. Lohead came to the rescue and gradually broke down the opposition of physicians.

The bovine type of tubercle bacillus produces primary tuberculosis in the human body in the same manner as the human type. The primary complex develops and the tissues become sensitized to tuberculo-protein from either type of organism. Wherever there has been a high incidence of tuberculosis among the cattle and living bovine type of tubercle bacilli were consumed in milk and other dairy products, the control of tuberculosis among animals resulted in a marked decrease of tuberculin reactions among children. In fact, the nation-wide tuberculosis control among cattle probably was the most important factor in bringing about the low incidence of tuberculin reactors among the present generation of children.

The bovine type of tubercle bacillus causes the same kind of re-infection type of lesions as the human type. In 1910 Park estimated that in New York City the bovine type was responsible for about 10 per cent of all infants dying from tuberculosis. He and Krumwide made bacteriological analyses and reviewed similar work of others on 1511 cases and found that 66 per cent of the generalized tuberculosis in children was due to the bovine type of bacillus. In 1933 Chang reported on a study of 200 cases of extrapulmonary tuberculosis in the Lakeville State Sanatorium in Massachusetts. The bovine type of bacillus was responsible for 71 per cent of the lesions in the age period from one to five years; 56 per cent from six to ten years; 34.4 per cent from eleven to sixteen years; and

11 per cent for those over seventeen years. The average for all age periods was 27.5 per cent.

Dr. O'Rear has called attention to the situation as reported by Griffith and others in England, where tuberculosis has not been controlled among the cattle and approximately 40 per cent of the animals have tuberculous lesions. The Committee on Tuberculosis in War-time of the National Research Council of Great Britain reported in 1941 that an extremely serious situation existed with reference to tuberculosis in man caused by the bovine type of bacillus. There had been a recent relative increase of 50 per cent of tuberculous meningitis among children which was thought to be due in large part to disease contracted through dairy products.

In 1908 Koch stated that the bovine type of tubercle bacillus had not been definitely demonstrated in a single case of chronic pulmonary tuberculosis in man. In fact, by 1922 only four such cases had been reported in the world. However, an intense study of this subject revealed that such cases are not uncommon. Indeed, in 1937 Griffith reported 163 such cases in Great Britain. In European countries it was found that from 1 to 6 per cent of all chronic pulmonary tuberculosis in man was due to the bovine type of bacillus.

Hedvall, of Sweden, in 1942 published a monograph entitled, "Bovine Tuberculosis in Man," in which he presented 94 cases, of whom 53 had pulmonary lesions. In 28, the pulmonary disease was of the reinfection type, markedly exudative in 19, and cavities were present in 20. Sixteen of these 28 patients had died by the time he made this report. Griffith, Hedvall and others have proved that the former belief that the bovine type of tubercle bacillus has a low virulence for man is untenable. Indeed, they have found that it is impossible to differentiate between lesions produced by the two types of organisms except by actually typing the organisms. Thus, it becomes apparent that in the United States the control of the bovine type of tubercle bacillus in cattle must have played a considerable role in the reduction of the infection attack rate, the morbidity and the mortality of tuberculosis in man over the past two decades. Therefore, at every opportunity we should pay tribute to the veterinarians, who early developed a clear vision of tuberculosis control among animals, overcame what at times seemed almost insurmountable opposition, solved a serious economic problem, markedly reduced primary tuberculosis and prevented much illness and death from the reinfection type of tuberculosis in humans.

Editorial

TUBERCULOSIS IN HOSPITAL PATIENTS

In 1925 Ralph Kinsella and his co-workers introduced routine x-ray film inspection of the chests of all persons admitted to the St. Mary's Hospital in St. Louis. Later when an appraisal was made of the routine procedures, such as urinalysis and serologic tests, it was found that the x-ray had revealed more evidence of previously unsuspected conditions than any other. Therefore the staff was of the opinion that routine x-ray inspection of the chest should be continued and extended to hospitals everywhere. Stewart and Mills (1933) reported on a one-month period when the Swedish Hospital in Minneapolis administered the tuberculin test to all entering patients and the entire personnel. Chests of the reactors were inspected with x-ray films and those with shadows were completely examined to determine etiology of lesions. A total of 149 persons were so observed, of whom 4.7 per cent were found to have progressive pulmonary tuberculosis, previously unsuspected. An identical program was instituted by Diehl at the University of Minnesota Hospitals in 1936 and by Harrington at the Minneapolis General Hospital in 1938 with results that proved conclusively that every person admitted to a hospital for any purpose, as well as all members of the personnel, should be adequately examined for tuberculosis. In 1940 the American Hospital Association published a monograph by Oatway entitled, "The Management of Tuberculosis in General Hospitals." This could well be adopted as a text in every hospital.

Bogen examined the 2200 patients in an institution for the mentally ill (1934) and found that tuberculous infection increased among them according to the length of their stay in the institution, which indicated that many of them contracted the infection after admission. Later Burns, Hilleboe and a number of others found a high incidence of tuberculosis among inmates and personnel of hospitals for the mentally ill, prisons, etc.

Some of the surveys conducted in general and special hospitals have been done in the ideal manner by making x-ray inspection of the chests of all tuberculin reactors and completing the examination with reference to etiology of disease casting shadows, as well as complete examinations of all reactors for extrathoracic tuberculous lesions. Others have consisted of almost nothing but x-ray inspection of the chest with diagnoses made from shadows alone.

In this issue of *Diseases of the Chest*, Scatchard and Duszynski present excellent observations on patients admitted to the Edward J. Meyer Memorial Hospital in Buffalo from July 8, 1944 to March 12, 1945. The study was initiated largely because of the high percentage of student nurses who developed tuberculosis lesions. This is a thoroughly dependable report because final diagnoses were not made from x-ray shadows alone. For example, among the patients admitted to the hospital over this period, 3.7 per cent presented shadows of lesions previously unsuspected by the patients. Although these shadows suggested the presence of tuberculosis, only the 1.8 per cent which were proved to be tuberculous by the presence of tubercle bacilli in the sputum or by post-mortem examination are reported as tuberculous. Certainly, the worthwhileness of this project cannot be challenged. Not only should the patients be informed of the presence of tuberculosis, but all other patients as well as personnel and visitors should be protected against contagion. The authors make the excellent recommendation that a tuberculosis control program be instituted in every general hospital. Obviously, the manner of conducting such a program depends upon several factors such as size of hospital and incidence of tuberculosis in the community.

Two screening processes should be applied everywhere, namely, the tuberculin test and x-ray film inspection of the chest. Each person who reacts to tuberculin has tuberculous lesions somewhere in the body. A relatively small number of such persons have gross lesions demonstrable by x-ray film inspection at the time of their first examination. Nevertheless the reactors whose films are clear at the moment may have lesions evolve to clinical proportions at some subsequent time. Therefore all reactors should be informed of the presence of tuberculosis before they leave the hospital and be strongly advised to have periodic examinations, never limited to but never omitting x-ray film inspection of the chest.

Inspection by x-ray should be made of every adult who enters a hospital regardless of the tuberculin reaction inasmuch as unsuspected nontuberculosis conditions of the chest, including the heart, may be revealed in this manner. X-ray inspections may be made from the usual 14 x 17 inch celluloid or paper films or photo-fluorograms. All of these are now in extensive use, and it has been shown that the results are essentially the same, regardless of which technique is used. Therefore the local facilities, expense, etc., are determining factors. Hilleboe and Weber have called attention to the fine opportunities in tuberculosis control by adequate examination of the 15 million patients admitted to hospitals annually and a like number seen in out patient departments of these institutions.

As far as hospital personnel is concerned, exposure to contagious tuberculosis is dangerous, whether the patient be on a tuberculous or nontuberculous service. To infect or reinfect such persons as members of personnel, other patients, and visitors, on either service is inexcusable, since we now have methods of detecting contagious tuberculosis promptly, and strict isolation technique has been developed to protect those who come in contact with contagious cases.

J. A. M.

Editorial

PNEUMOPERITONEUM TREATMENT OF PULMONARY TUBERCULOSIS

Since 1931, artificial pneumoperitoneum has been in use for the treatment of pulmonary tuberculosis. Its application for this purpose was discovered incidentally when in a case of intended artificial pneumothorax, air was injected into the peritoneal cavity. Since then, rapid strides have been made in its widespread clinical use. Subsequent research studies brought about a clear understanding of the mechanics of the therapeutic efficacy of this measure. Basically, its influence upon the lung is in no way different from that of artificial pneumothorax. It is known that the therapeutic effectiveness of the latter is conditioned upon adequate pulmonary relaxation. A perview of available investigative data indicates that the same holds true of artificial pneumoperitoneum. If this is so, pneumoperitoneum, of necessity, has definite curative potentialities in pulmonary tuberculosis.

Let us look at the available pertinent information. Accurate measurements have demonstrated that, by systematically maintained pneumoperitoneum, one is able to attain a substantial elevation of the diaphragm. Of course, no satisfactory diaphragmatic rise can be anticipated when the diaphragm is fixed by adhesions. In individuals without extensive diaphragmatic adhesions, elevation of the diaphragm by air injected intraperitoneally is followed by a shortening of the apico-basal diameter of the lung. This may amount to as much as 7.3 cm. Expressed in other terms, the distance between the apex and base of the lung, as measured on a standard roentgenogram, can be reduced by 32.8 per cent on inspiration and by 34.3 per cent on expiration. The decrease in the apico-basal diameter of the lung by artificial pneu-

moperitoneum is associated with a considerable reduction in the volume of the lung. An even greater reduction in the lung volume can be established by the combination of phrenic nerve operation and pneumoperitoneum.

Induced reduction in the lung volume signifies pulmonary relaxation. The latter initiates a number of changes in the lung which, potentially, are conducive to the healing of the tuberculous lesion. These are: 1) Relative tissue anoxemia; 2) Accumulation of carbon dioxide; 3) Lymph stasis; 4) Approximation of cavity walls; 5) Lessened bronchogenous, lymphogenous and hematogenous spread; 6) Diminished absorption of toxins.

There is ample experimental and clinical proof of the inimical effect of these changes upon tubercle bacilli, and of their beneficial influence on the resorption of pulmonary exudate and also, on the formation of fibrous tissue. In other words, artificial pneumoperitoneum offers the necessary pre-requisites of healing.

Pneumoperitoneum has a wide field of applicability in the treatment of pulmonary tuberculosis. It is well to remember in this connection that it is preferable to treat unilateral cases with the combination of phrenic nerve operation and pneumoperitoneum, although, in some instances, pneumoperitoneum alone may bring about gratifying results. When pneumoperitoneum is given as an independent therapeutic measure, it can always be supplemented by a phrenic nerve operation if circumstances so require.

It must be emphasized that pneumoperitoneum is not a competitive procedure as far as other forms of pulmonary relaxation therapy are concerned. Sound clinical practice necessitates that it should be looked upon as part and parcel of a well-conceived and well-integrated, *selective* therapeutic system. With this in mind, it is interesting to see that, according to the great majority of reports in the literature, this more or less new therapeutic approach is becoming a standard measure, in spite of occasional endemic therapeutic prejudice.

The subject of indications for pneumoperitoneum is too large to be discussed within the short space of this writing. For details, the reader is referred to numerous publications and texts which appeared during the past few years. However, there are certain items which deserve special attention.

Pulmonary hemorrhage may be effectively checked by pneumoperitoneum when it is impossible to induce artificial pneumothorax and in cases where one is unable to ascertain from which lung the bleeding originates. Following induced pneumoperitoneum, the consequent relaxation may seal the ruptured blood vessel. The resulting less negative intrapleural pressure reduces the intrapulmonary blood flow and thereby decreases or stops the hem-

orrhage. Also, it is interesting to recall that similar results may be expected from the diminished inspiratory descent of the diaphragm. The latter will decrease the flow of blood through the inferior vena cava into the right auricle. This, in turn, means lessened amounts of blood driven to the lungs by the right ventricle.

In recent bronchopneumonic and pneumonic tuberculosis of the lung, artificial pneumothorax is bound to invite the development of empyema. The grave consequences of the latter should serve as a deterrent to the use of pneumothorax in these instances. Pneumoperitoneum which, naturally, is free of this complication should be looked upon as the treatment of choice in patients with these types of lesion. On the other hand, one can *a priori* predict failure of treatment with pneumoperitoneum when patients are selected whose lung lesion is characterized by extensive fibrosis or by rigid-walled cavities. Furthermore, one should never forget that it is a mistake to use pneumoperitoneum as a last resort.

Brock of North Carolina, pointed out at the last annual meeting of the College in 1946 the remarkable effect pneumoperitoneum has on the closure of tension cavities. His statement is worth quoting: "When a phrenemphaxis is done on one side, followed by pneumoperitoneum, two things are accomplished. First, the high rise of the diaphragm relaxes the lung and thereby facilitates drainage. Secondly, there is a marked relaxation of the lung and bronchial tree. There is little shortening of the bronchi and little narrowing of their lumina during expiration and this allows for continuous drainage through patent bronchi. This also allows for healing of the endobronchial lesion. With the introduction of pneumoperitoneum in acute bilateral advanced disease with tension-cavity formation in the Negro, drainage may be so adequate that the disease may clear entirely. In my opinion, such disease in the Negro has been looked upon as fatal, and such a result could not have been obtained by any other method of collapse therapy at our disposal."

The more frequent use of artificial pneumoperitoneum in a large group of patients with far advanced bilateral pulmonary tuberculosis deserves a great deal of thought. These are individuals—who may be called the "forgotten men" of the institutional population—for whom no form of mechanical relaxation therapy is being offered in accordance with conventional concepts. Artificial pneumoperitoneum may bring about welcome changes in a great many of these cases. In addition to improvement in their pulmonary condition which may prove curative or may prepare the patient for major surgical intervention, one may observe the favorable effect of pneumoperitoneum on the competency of cough and on the course of intestinal tuberculosis. The incidence of the latter,

whether it is recognized or not, is high in far advanced pulmonary tuberculosis.

Some recent discussions of this subject admit the usefulness of pneumoperitoneum in controlling pulmonary tuberculosis in women when the treatment is given postpartum. This recommendation clearly recognizes the favorable therapeutic potentialities of pneumoperitoneum which result from the elevation of the diaphragm and from the consequent relaxation of the diseased lung. If this is so, it is difficult to comprehend why should not the same hold true of men and nonpregnant women who have pulmonary tuberculosis of the same kind and extent. Also, it is hard to conceive why is the value of pneumoperitoneum as a psychologic measure emphasized in particular. Over-emphasis of the psychologic effect of pneumoperitoneum by some clinicians connotes a metaphysical trend of thought which has no room in sound clinical practice.

In closing, just a few words about statistical analyses. It is a foregone conclusion that the end results of pneumoperitoneum treatment will be always unsatisfactory if unsuitable cases are selected for treatment. This generic truth applies to any form of therapy. Also, it is self-evident that when this treatment is given for too short a time or with unsuitable technique, the therapeutic result will be poor. Therefore, for the benefit of the patient as well as for the sake of scientific accuracy, a scrupulous selection of cases for this treatment and adequate technique are mandatory. Only correct and objective clinical judgment will protect the welfare of the patient and is likely to contribute to a competent evaluation of the therapeutic results.

—A.L.B.

Retiring President's Address

CHARLES M. HENDRICKS, M.D., F.C.C.P.*

El Paso, Texas

About twenty-five hundred years ago in a small city in Asia Minor, a philosopher who was called Heraclitus propounded the revolutionary proposition that the only thing that does not change is change itself. Everything, said Heraclitus, becomes; everything is and is not. Quite understandably, his words were ignored, if only because of their incomprehensibility. However, though vague and slightly paradoxical, they were in keeping with his rank of philosopher and metaphysician, and today we have come to accept his theory that everything is in a constant flux. Nothing is static.

I do not believe there are many who will differ with Heraclitus over the continuance of change. We all have seen too many alterations even in the past 30 years, particularly, in the more highly civilized countries, to think otherwise. These years will go on record as being an exceptional period of unrest and change... of strife and movement... of invention and scientific progress, during which things spiritual and material, economic and social, have been shaped and moulded, destroyed and recreated, to an extent probably never before witnessed by a single generation.

The greatest change we have seen without doubt has been in people themselves. Their mental, physical, and moral health have been on a definite decline throughout the world. While this may be somewhat anticipated in European and Asiatic countries, where war and inefficient economies have rampaged, giving leeway to disease, famine, and poverty in general, we should not have expected the breakdown of moral values and personal integrity in the United States that we have seen demonstrated by black markets, illegal war profiteering, alcoholism, increased gambling, parent and juvenile delinquency, and the other social maladies that have so flagrantly prevailed.

Some of these changes are undoubtedly due to the influence of World War I, the inflationary boom that followed it, the depression, and World War II. There is good cause to believe that these distressing times put a stress and strain on people that affected their metabolism in such a way that their very traits of character were depleted. Profound students claim that personality and character traits are closely related to fundamental metabolism. Certainly this is a point worth investigating. It has been pointed out many times in the past that conditions leading to two bloody world wars within 25 years among the most civilized nations of the world may be attributed to a lack of proper education. Many educators have recently stated that our present system of education is the most colossal failure in history.

We most assuredly are aware that the low salaries for teachers that exist in all countries have kept the best talent from this important profession and, consequently, young people have been deprived of proper training in building sound morality. A recent survey revealed that there are 7,000,000 children between the ages of 5 and 17 not now in school. One teacher in 10 now holds a sub-standard certificate. There are 53

*Presented at the 13th Annual Meeting, American College of Chest Physicians, June 7, 1947, Atlantic City, New Jersey.

per cent less students in teachers colleges. There are 50,000 vacant teaching positions. There are 10,000 closed classrooms. More than 10,000,000 American adults are functionally illiterate. Thirteen per cent of the men in the Armed Services during the war were illiterate.

In the educational systems, particularly in the United States, there has been a tendency to stress scientific training—the knowledge of the mechanistic principles of life; social training has been almost wholly ignored. In consequence, science has progressed while morality has lagged far behind. Without proper instruction in this field, young people have found constant difficulty in adapting themselves to the many varied problems that they meet in life. Though imbued with mechanistic know-how, they are almost completely illiterate in social values and integrity.

The field of medicine has not escaped having its face lifted, either. The past 40 years have been pregnant with scientific development. Perhaps the future generations will acknowledge this period to be one of progress, more fruitful than ever previously encountered in the slow march of the preceding centuries. Not long ago the general practitioner was a heart specialist, lung specialist, stomach specialist, skin specialist, obstetrician and surgeon all fused into one. Death always lurked around the corner. Typhoid and small pox came most every Spring and every Fall. Scarlet fever, diphtheria, and pneumonia took their annual toll. Those were the days when the doctor depended almost wholly on the capability of living tissue to remedy or remove disease or repair injury. Needless to say, the modern doctor has transcended all that, for by learning to conquer the acute infections and to control epidemics, we are left with diseases of unknown cause, as accounting for the majority of illnesses today.

Admitting this great improvement of the medical scene, we nevertheless find the medical profession drastically illiterate concerning many things. Just as general education has ignored training in social problems, so has medicine ignored chronic illnesses and socio-economic factors in its worthy institutions of training. While antibiotics and vaccines have thrown many acute infections for a concrete loss, the chronic illness problem has grown. Now, such diseases as cancer, arthritis, and diseases of the circulatory system have risen to take the lead in mortality and suffering. While it is axiomatic that in our field one disease diminishes only to be replaced by another, it also is evident that these chronic illnesses are more than merely substitutes for those already controlled. They are the most dangerous antagonists known to man. And while little is known to man concerning these malignant diseases, that "little" is not being distributed to our medical students. Instead, they graduate, capable of treating the diseases already defeated, but practically uninformed concerning this killer and disabler of man... the chronic disease.

The seriousness of this situation is more apparent when we note that the present trend in population is towards a large number of older people, because it is the older people who are the most susceptible to chronic diseases. By this, I do not mean to imply that younger people are not in danger. The facts in the case show that nearly half the sufferers of chronic diseases are under forty-five and 70 per cent of them are under fifty-five.

Statisticians report there is to be an exceptionally large number of people at 65 and over in the coming years. In 1950, the number of

adults 65 and over will equal the number of children under 5 years of age. This shifting of numbers in age groups also affects our military situation. If we should be forced into a war anytime during the next 20 years, we will find it difficult, indeed, to muster 15,000,000 men for the armed forces, if we employ the same physical standards used in World War II.

Our profession is an integral part of society, affecting and being affected by the changes that are brought about.

The failure to realize that it must change as society changes has been one of the most characteristic features of medicine in all ages. The present is no exception—we hold in a certain arrogance to the belief that the present form of medicine is vastly superior to those of all preceding ages. Medical progress has shown a crystallization on a line of endeavor. This line has been followed long after its usefulness has passed. It has been followed until the form of medicine was no longer suitable to the time and part of the public wants to discard it. We have seen this happen in group health plans. People have demanded less expensive medicine, and have not received what they asked for. As a result, we see such radical departures from a reasonable solution as the Wagner-Murray-Dingle bill.

The only successful answer, then, is that we in the field of medicine keep ourselves adjusted to the times, making certain that we are working in the right direction toward the right goals. The first step in affirming this policy would be to make provisions for the change in our population. Fully aware of the facts that by 1960, one-sixth of the population will be over 60 years of age, that one in six of the present population has a chronic disease, that mental diseases equal and probably surpass physical diseases, we must dig in now to bring forth pertinent information about the etiology and therapy of the chronic illnesses, that we may successfully take this rearrangement in our stride. We must not hesitate to wage open warfare on this scourge, availing ourselves of every possible facility; for if we cannot protect older people from its devastation, if we cannot protect longevity from becoming a painful burden . . . then those accomplishments in giving longer life are but wasted effort.

Pathology is but one of the problems of chronic diseases. While basically the most important, it must be supplemented by proper hospitalization. We have found this essentially true in the treatment of acute illnesses, but the need is even greater when it comes to arranged treatment of long-term diseases. When a man is sick, the only thing that should face the physician is his need for hospitalization. If the patient cannot be adjusted to a home-care program, for various commonplace reasons, then he should be admitted into a hospital and accorded the treatment that corresponds with his illness. If he needs a hospital bed for a year, two years, or for duration of his life, he should have it. Certainly, the fact of requirement is the important point and not the length of time for which it will be needed. No greater harm can be done than to transfer a patient out of any hospital before his problem has a solution or before permanent scarring has taken place.

In our own field, Diseases of the Chest, there is a proneness to discharge patients with acute respiratory diseases from under our care when the acute symptoms subside without a complete checkup. I firmly believe that this practice is responsible for the development of many chronic diseases of the chest. This point should be studied because

herein may lie the solution to the prevention of many diseases such as bronchiectasis, emphysema, and asthma.

I regret to say, however, that in this chain of reasoning, concerning the hospitalization of both acute and chronic cases, there is a "missing link". We all well know that this link is none other than the hospital itself. There are far too few hospitals, too few nurses and technicians, and a mal-distribution of complete medical care.

The American people have plagued the medical profession with this query for the last 15 years, and, excepting a small amount of the individual health groups organized by private physicians, little has been offered to alleviate this condition. As I said before, we are now faced with a social "touchstone," the Wagner-Murray-Dingle bill, because the profession has dogmatically stuck to the tenets of private enterprise rather than compromise. Unfortunately, those people who cannot afford adequate medical care and those who represent them, do not feel as strongly against collectivism as most of us.

In short, when surveying the medical problems that we seek to improve upon, we cannot help bumping into ordinary factors of everyday life. This only reveals more clearly the influence that society and the medical profession have upon each other. The medical profession, therefore, cannot hope to remain isolated upon a high social pinnacle and look down upon the turbulent masses. The doctor belongs with his patient, whether in treating his ailment, or in assisting him in his personal problems.

The trouble is that many of us confuse medical practice with medical science. While great benefits have been achieved from medical research and the research in other fields, these have fundamentally been the work of the scientist and not the practitioner.

Certainly medical research must be continued and increased; in fact, there is a great need for the research worker in medicine to team up with the research scientists in allied fields. The great challenge of cancer, poliomyelitis, and the diseases of the circulatory system, among other malignant diseases, will require great organization and mutual assistance among all branches of scientific research.

But it takes the practitioner to deal with human beings, to apply that knowledge gained by the laboratory scientist. There is an old adage which quite appropriately fits; it says "you cannot carry an experiment bleeding from the laboratory to the bedside." The medical research scientist and the practicing physician each has his proper and equally important place, and it would be a grave error to confuse their talents or duties.

Despite these scientific trends found in general practice, I think the physician of today realizes more and more that many diseases are psychosomatic insofar as they include both the emotional and the physical mechanisms. He has learned that a better knowledge of psychiatry will make him more capable in handling the stresses exhibited by the patient.

The upshot of the American medical perspective may be found once more with friend Heraclitus, that the only thing that does not change is change itself. Too long we have maintained a tunnel-vision attitude towards the public need for better medical treatment at a lower cost. Now, before we are faced with a legal mandate; namely, socialized medicine, we must integrate our resources with those of other fields that we may more successfully achieve our goal. Medical indigency is

more than a problem between doctor and patient. Every person who is medically or mentally ill is a problem to the community at large. If we are to prevent wastage of human resources and maintain a peaceful world, we must build upon a solid foundation of good health.

The past 30 years have brought about great improvement in the internal relationships of our profession. The old antagonisms, jealousies, and prejudices have, for the most part, given way to a spirit of tolerance and cooperation. Let us now join hands in the same spirit with the educator, the sociologists, the clergymen, the financier, the industrialist, and the statesman, because, only by the coordination of all the fields of human endeavor, can we hope to create a new and better era for people and for medicine.



MAJOR GENERAL SHELLEY U. MARIETTA
PRESIDENT
AMERICAN COLLEGE OF CHEST PHYSICIANS
1947-1948

Major General Shelley U. Marietta Installed as College President

Major General Shelley U. Marietta was installed as President of the American College of Chest Physicians at the annual meeting of the College in Atlantic City, June 5-8, 1947.

General Marietta was born in Iowa in 1881 and attended grade, high school and college in Des Moines, Iowa. He graduated from the Dental Department at Drake University in 1902 and practiced dentistry in Des Moines for three years, being a member of the dental faculty of the University during this period.

He graduated from the Medical Department, University of Illinois, Chicago, in 1909 and after serving one year of rotating internship, entered medical practice in Des Moines, Iowa, remaining there for a period of one year, entering then on active duty in the Medical Reserve Corps of the Army. General Marietta graduated from the Army Medical School, Washington, D. C., in May 1912 and was commissioned in the Regular Army Medical Corps. After serving at the Presidio of Monterey, California, he was assigned to duty in September 1912 at the Army tuberculosis hospital at Fort Bayard, New Mexico, where he remained for two years. During this period, he was trained in the administration of artificial pneumothorax and assisted in a few operations of rib resection anteriorly and posteriorly over the upper chest to encourage the collapse of tuberculous cavitation in the presence of pleural symphysis. This was the beginning of the use of such procedures in the Army hospitals. He then served a two-year tour of duty at Corregidor and Manila in the Philippine Islands, returning to the United States in August 1916. After seven months' duty at Corpus Christi, Texas, as inspector-instructor with the Texas National Guard, he was transferred to San Antonio, Texas, for duty with the Recruiting Depot at that point. In July 1917, General Marietta was assigned as commanding officer of the base hospital at Camp Gordon, Georgia, and sailed for France in June 1918 as commanding officer of Base Hospital No. 43 (the Emory Unit). He spent 14 months in France, including periods in the Hospital Center, Savenay, France; Headquarters, American Expeditionary Forces, Tours, France; Headquarters, American Expeditionary Forces, Antwerp, Belgium; and as Commanding Officer of the Army Hospital in Brest which was later expanded to include the hospital center at Kariwan.

He returned to the United States in August 1919 and served as Commanding Officer, General Hospital No. 8 at Otisville, New York. At the termination of this duty in the fall of 1919, General Marietta was given a refresher course in tuberculosis at New Haven, Connecticut, and was then detailed to Walter Reed General Hospital as Assistant Chief of the Medical Service until February 1920 when he was assigned to duty at Fitzsimons General Hospital, Denver, Colorado, and acted there as Assistant Chief, and Chief of the Medical Service for a period of three and a half years. He also acted as an instructor in physical diagnosis in the school established there for students sent to that hospital for special instruction and supervised the study over a period of two years of the Deycke-Muth partial antigens for the treatment of tuberculosis. These antigens had been developed in Germany, prior to World War I, and a considerable supply of the materials were procured and sent to the United States for investigation. The antigens consisted of separate ex-

tracts of the protein, carbohydrate and fatty components of the tubercle bacillus. An extensive literature was provided and the study was made by a group consisting of a chemist, three or four clinicians, a group of nurses and several technicians. A fairly extensive study including controls was made and report rendered to the Surgeon General of the Army at intervals of the progress of the work. The product was considered after the two-year interval to be of little or no value in the treatment of tuberculosis and the study was abandoned.

Following the tour at Fitzsimons General Hospital, General Marietta continued in professional work, devoting a total period of approximately 22 years of his service to this field and serving at the Station Hospital, Fort Sam Houston, Texas; Letterman General Hospital, San Francisco; Walter Reed General Hospital, Washington, D. C.; Tripler General Hospital, Honolulu, T. H.; again at the Station Hospital, Fort Sam Houston, Texas; and at Walter Reed General Hospital. In the fall of 1928 he was a student for three months at the Mayo Foundation, Rochester, Minnesota. In December 1939 he was advanced to the grade of Brigadier General and assigned as Commanding Officer of Walter Reed General Hospital. He was appointed Commanding General of the Medical Department Professional Service Schools (Medical, Dental, Veterinary, Dietetic, Physical Therapy and Technician Training) in February 1941, and in September 1943 was promoted to the grade of Major General. Through choice he remained also as Commanding Officer of Walter Reed General Hospital during this entire period.

General Marietta was retired for age January 31, 1945 and returned to active duty the following day, remaining on duty until February 9, 1946.

General Marietta is a Life Member and Fellow of the American College of Chest Physicians, a Fellow of the American Medical Association, a member of the Association of Military Surgeons, Fellow of the American College of Physicians, and a diplomate of the American Board of Internal Medicine. He is a member of the Eta Chapter of Alpha Kappa Kappa and of the Illinois Chapter of Sigma Xi.

Section on Diseases of the Chest in the American Medical Association

A resolution proposing the establishment of a Section on Diseases of the Chest in the Scientific Assembly of the American Medical Association, which was sponsored by the American College of Chest Physicians, was brought before the House of Delegates of the American Medical Association at their annual session and was unanimously accepted. The acceptance of this section in the American Medical Association is an important step forward for the chest specialists in that it establishes for all time the specialty of diseases of the chest.

Dr. Walter E. Vest, Huntington, West Virginia, a Fellow of the College and a member of the House of Delegates of the American Medical Association, introduced the resolution. A number of the Delegates were instructed by their state medical societies to support the resolution.

RESOLUTION

WHEREAS, There are approximately 2,500 physicians and surgeons in the United States engaged in the practice of diseases of the chest; and

WHEREAS, This specialty has made notable progress in advancing the knowledge of diseases of the chest during the past ten years; and

WHEREAS, A total of 388 chest specialists registered at the annual session of the American Medical Association held at San Francisco, July 1-5, 1946; and

WHEREAS, The registration exceeded this total in but four of the seventeen sections of the American Medical Association, i.e., Internal Medicine, Surgery, General and Abdominal, Obstetrics and Gynecology, and the General Practice of Medicine; and

WHEREAS, Diseases of the chest constitute a very large and important segment of the entire volume of medical practice; therefore be it

RESOLVED, By the House of Delegates of the West Virginia State Medical Association, that our delegates to the American Medical Association be instructed to present this resolution in the House of Delegates at the coming session in Atlantic City, with the request that a Section on Diseases of the Chest be established in the Scientific Assembly of the American Medical Association.

The Resolution was referred to the Reference Committee on Sections and Section Work.

ABSTRACT OF REPORT OF REFERENCE COMMITTEE ON SECTIONS AND SECTION WORK

Dr. Roy B. Henline, Chairman, presented the following report:

"3. Resolution on Establishment of Section on Diseases of the Chest: Your committee received a resolution introduced by Dr. Walter E. Vest, West Virginia, regarding the establishment of a Section on Diseases of the Chest. The resolution points out that there are about 2,500 physicians engaged in the practice of this specialty; that an enormous amount of progress has been made; that the subject is of enormous import to the American people, and that the general welfare would be served by the establishment of such a section. After hearing from eight Fellows of the Association, who appeared before it, your reference committee is of the opinion that it is advisable to establish such a section, and to that end the committee recommends that section 3 of article 5 of the Constitution be amended by deletion of the figures "175" and the substitution

therefor of the figures "176"; and that the By-Laws be amended by adding to section 1 of chapter 15 a newly numbered section, as follows: "No. 19. Section on Diseases of the Chest." The committee further recommends that in the interim the Council on Scientific Assembly allot a portion of the program of the Section on Miscellaneous Topics at the next annual session to the subject of diseases of the chest, and that at that time a section be organized to be known as the Section on Diseases of the Chest."

Respectfully submitted,

Roy B. Henline, Chairman

Edgar V. Allen

Burt R. Shurly

Lowell S. Goin

Scott Lord Smith

"Dr. Henline moved adoption of the third section of the report of the reference committee dealing with the Resolution on Establishment of Section on Diseases of the Chest, and the motion was seconded by Dr. Thomas S. Cullen, Maryland. After discussion and suggestions of amendments, it was moved by Dr. E. Vincent Askey, California, seconded by Dr. Walter E. Vest, West Virginia, and carried, that the House approve a Section on Diseases of the Chest as a section of the Association.

"Dr. Askey then moved that this be referred to the Committee to Study Revision of the Constitution and By-Laws so that that committee may take appropriate steps to see that the new section has the proper representation in the House of Delegates, and the motion was seconded by several and carried.

"On motion of Dr. Henline, seconded by several and carried, the report of the reference committee as amended was adopted as a whole."

THIRTEENTH ANNUAL MEETING

American College of Chest Physicians

The Thirteenth Annual Meeting of the American College of Chest Physicians, recently concluded in Atlantic City, was one of the most successful meetings the College has ever had. Registration for the four day meeting, June 5-8, was the largest for any of the College meetings. There were 655 physicians registered for the scientific assembly, and the total, including wives and guests, exceeded 1,000.

<i>States</i>	REGISTRATION	<i>No. Registered</i>
Alabama	5
Arizona	4
Arkansas	1
California	24
Colorado	18
Connecticut	9
Delaware	6
District of Columbia	23
Florida	8
Georgia	5
Idaho	2
Illinois	33
Indiana	5
Kansas	2
Kentucky	10
Louisiana	2
Maine	3
Maryland	16
Massachusetts	22
Michigan	14
Minnesota	10
Mississippi	3
Missouri	9
Montana	1
Nebraska	2
New Jersey	48
New Mexico	1
New York	114
North Carolina	15
Ohio	22
Oklahoma	4
Oregon	1
Pennsylvania	66
Rhode Island	4
South Carolina	10
Tennessee	10
Texas	20
Utah	1
Virginia	16
Washington	2
West Virginia	9
Wisconsin	6
Wyoming	1
	TOTAL	587

<i>U. S. Possessions</i>	<i>No. Registered</i>
Alaska	1
Hawaii	2
Puerto Rico	8
<i>Other Countries</i>	
Argentina	4
Belgium	1
Brazil	2
Canada	16
China	1
Cuba	9
Czechoslovakia	1
Dominican Republic	1
England	3
India	1
Italy	1
Lebanon	3
Mexico	3
New Zealand	1
Palestine	1
Panama	1
Peru	5
Philippine Islands	1
Scotland	1
Switzerland	1
TOTAL	68
FINAL TOTAL	655

COLLEGE AWARD

The first College Award was made this year. The recipient, Dr. Jay Arthur Myers, Minneapolis, Minnesota, Past-President of the College and Editor-in-Chief of the College journal "Diseases of the Chest," was presented with a gold medal especially designed for the College, and a Certificate of Award, for meritorious service in furthering the progress in the field of diseases of the chest. The presentation was made at the general assembly of the College in Atlantic City.

EXAMINATIONS FOR FELLOWSHIP

On the first day of the meeting, June 5, seventy-two candidates took their oral and written examinations for Fellowship in the College. This is the largest group to date to take the examinations at a College meeting.

CONVOCATION

At the Second Annual Convocation, held on June 7, thirty-four physicians received their Fellowship Certificates and signed the College Roster. A list of the new Fellows is given later in this report. Dr. Richard H. Overholt, Brookline, Massachusetts, the President-Elect of the College, presided at the Convocation and Dr. Robert Livingston Johnson, Philadelphia, Pennsylvania, President of Temple University, delivered the Convocation Address.

SCIENTIFIC PROGRAM

An excellent scientific program was presented under the chairmanship of Dr. Andrew L. Banyai, Milwaukee, Wisconsin, and a great many important matters concerning the specialty of diseases of the chest were discussed at the meeting. Papers presented at the meeting will be published in future issues of "Diseases of the Chest."

PRESIDENTS' BANQUET

Dr. J. Winthrop Peabody presided at the Presidents' Banquet and presented a Certificate of Merit, in recognition of valuable services to the College, to Dr. Charles M. Hendricks, the retiring president.

The New Jersey and Pennsylvania Chapters of the College served as hosts for the meeting and the cocktail party which was given by them just prior to the Presidents' Banquet was an outstanding success.

LATIN AMERICAN DINNER

A dinner was given at the Ambassador Hotel, Atlantic City, on the closing day of the annual meeting of the American College of Chest Physicians, for the members of the College from the Latin American countries and their wives. The dinner was planned under the direction of Dr. Alberto Chattas of Cordoba, Argentina, and Dr. Donato G. Alarcon of Mexico City served as Toastmaster. After dinner brief talks were made by several of the Latin American Delegates.

Dr. and Mrs. Juan Herradora of Jersey City, New Jersey, gave a cocktail party preceding the dinner, and served as hosts at the annual meeting to the physicians and their families from the Latin American countries.

A breakfast meeting sponsored by the Council on Pan American Affairs of the College was held the morning of Sunday, June 8, at which Dr. Chevalier L. Jackson, Philadelphia, Pennsylvania, Chairman of the Council, presided. Plans were discussed concerning the activities of the College Council during the coming year.

INTERNATIONAL NIGHT DINNER

Thursday, June 5, was International Night at the meeting of the American College of Chest Physicians. A dinner was given in honor of all the members of the College from other countries. Dr. Harry C. Warren, San Francisco, California, Chairman of the Council on Pan Pacific Affairs of the College, presided at the dinner, and talks were made by several of the honored guests.

NEW COLLEGE OFFICERS

Major General S. U. Marietta (Retired), Washington, D. C., took office as President of the College for the ensuing year, and the following officers were unanimously elected: Richard H. Overholt, M.D., Brookline, Massachusetts, President-Elect; Louis Mark, M.D., Columbus, Ohio, First Vice-President; Harry C. Warren, M.D., San Francisco, California, Second Vice-President; Joseph C. Placak, M.D., Cleveland, Ohio, was re-elected as Chairman of the Board of Regents, and Paul A. Turner, M.D., Louisville, Kentucky, was elected Member-at-Large to the Executive Council. Dr. Benjamin L. Brock of Chicago, Illinois, has been appointed Secretary-Treasurer of the College.

NEWLY-ELECTED REGENTS AND GOVERNORS

Following is a list of the newly-elected and re-elected Regents and Governors for the College:

Regents:

Edward A. Greco, M.D.	District No. 1
Karl Schaffle, M.D.	District No. 5
Herbert L. Mantz, M.D.	District No. 8
Frank S. Dolley, M.D.	District No. 13
Hastings D. Walker, M.D.	Hawaii
David E. Garcia, M.D.	Puerto Rico

Regents in other countries:

Sir Sidney Sewell, M.D.	Australia
Juan Tanca Marengo, M.D.	Ecuador
Gustave Maurer, M.D.	Switzerland

Governors:

David H. Shipp, M.D.	Arkansas
Howell Randolph, M.D.	Arizona
Arnold Minnig, M.D.	Colorado
Edgar W. Davis, M.D.	District of Columbia
M. Jay Flipse, M.D.	Florida
Orval F. Swindell, M.D.	Idaho
Charles F. Taylor, M.D.	Kansas
Francis Welch, M.D.	Maine
O. C. Brantigan, M.D.	Maryland
Willard B. Howes, M.D.	Michigan
Merle D. Bonner, M.D.	North Carolina
D. W. Heusinkveld, M.D.	Ohio
Alvis E. Greer, M.D.	Texas
Edgar C. Harper, M.D.	Virginia
John E. Nelson, M.D.	Washington
George Maxwell, M.D.	West Virginia

Governors in other countries:

Angel M. Marchand, M.D.	Puerto Rico
John Bell Ferguson, M.D.	Victoria, Australia
Jorge Higgins, M.D.	Ecuador
Reginaldo Fernandez, M.D.	Central Brazil
Jose Silveira, M.D.	Northern Brazil
Eduardo T. Etzel, M.D.	Southern Brazil
Gilberto V. Zamorano, M.D.	Valparaiso, Chile
Gonzalo Corbalan T., M.D.	Santiago, Chile
Ildefonso Garreton Unda, M.D.	Concepcion, Chile

Latin American Delegates

Argentina:

The following members of the College from Argentina attended the annual meeting of the College in Atlantic City: Dr. Gonzales Aguilar, Cordoba; Dr. Manuel Albartal, Buenos Aires; Dr. Alberto Chattas, Cordoba; and Dr. Bartolome Pardo, Santa Fe. Dr. Albartal, accompanied by his wife, were recent visitors to Chicago, and are now visiting in Washington, D. C. before their return to Argentina. Dr. and Mrs. Chattas, and Miss Feigun, sister-in-law to Dr. Chattas, are now touring the United States. They will spend some time in New York City and Washington, D. C. Dr. Chattas is appearing on the program at the meeting of the Pan American Academy of Pediatricians.

Brazil:

Dr. Joaquim S. Cavalcanti of Recife, Pernambuco, was the only delegate to the College meeting from Brazil. Dr. Enrico Prado, Belo Horizonte, Brazil, attended the meeting as a guest.

Cuba:

Dr. Gustavo Aldereguia, Dr. Rene G. Mendoza and Dr. Antonio Rodriguez Diaz, Havana, Cuba, were delegates to the annual meeting of the College to represent the Cuban Chapter. Several other physicians from Havana attended the meeting as guests. Dr. Aldereguia is visiting various cities in the United States before returning to Havana.

Mexico:

Dr. Donato G. Alarcon, Regent of the College for Mexico, and Dr. Manuel Alonso, Secretary-Treasurer of the Mexican Chapter of the College, both of Mexico City, were delegates to the annual meeting in Atlantic City.

Republic of Panama:

Dr. Maximo Carrizo, Colon, Republic of Panama, represented the Central American Chapter of the College at the Atlantic City meeting. Dr. Amadeo Vicente Mastellari, Regent of the College for the Central American Chapter, had to cancel his intended trip to the United States at the last moment and therefore appointed Dr. Carrizo as delegate to the College meeting from the Republic of Panama.

Peru:

Three delegates from Lima, Peru attended the Atlantic City meeting of the College. They were Dr. Max Espinoza Galarza, Dr. Juan A. Macchiavello, and Dr. Leopoldo Molinari. Dr. Molinari was accompanied by his wife and after the meeting in Atlantic City they visited Chicago for a few days, and made a trip to the Mayo Clinic, in Rochester, Minnesota. They are now spending a few days in Washington before returning to Lima.

Puerto Rico:

An excellent delegation of College members from the Puerto Rico Chapter attended the annual meeting in Atlantic City. They were Dr. Antonio Acosta Velarde, Santurce; Dr. Ramon T. Colon, San Juan; Dr. Rivero E. Martinez, Hato Rey; and Dr. Felix M. Reyes, Bayamon. Mrs. Acosta Velarde accompanied her husband to the meeting, and Dr. Martinez was accompanied by his wife and two daughters.

European Delegates

Belgium:

Belgium was represented at the 13th Annual Meeting of the American College of Chest Physicians by Dr. Pierre H. Nep of Tirlemont.

Czechoslovakia:

One physician from Czechoslovakia registered at the annual meeting of the College. He was Dr. Pavel Lukl of Hradec Kralove.

England:

Dr. Clifford Hoyle, Dr. John McMichael and Dr. Kenneth Robson, all of London, represented England at the annual meeting of the College in Atlantic City. Dr. Hoyle is Editor of the British Journal of Tuberculosis and Diseases of the Chest.

Italy:

Italy was represented at the annual meeting of the College by Dr. Theodoro D. Posteli of Bologna.

Scotland:

Dr. G. Ewart Martin of Edinburgh, Scotland, attended the Atlantic City meeting of the College.

Switzerland:

Switzerland was represented at the Atlantic City meeting of the College by Dr. Gustave Maurer of Davos. Dr. Maurer was elected as Regent of the College for Switzerland at the annual meeting of the Board of Regents in Atlantic City.

Far and Near East Delegates

China:

Dr. Lincoln Pan of Shaoshing, Chekiang, China, who is studying at the University of Michigan, Ann Arbor, attended the Atlantic City meeting. Dr. Shu Fan Li of Hong Kong sent a message to the College membership regretting his inability to attend.

India:

Dr. A. C. Sankara Iyer of Bangalore, India, attended the annual meeting of the College in Atlantic City. Dr. Sankara Iyer is at present located in Weston, Ontario, Canada.

Lebanon:

Three Fellows of the College from Beirut, Lebanon, attended the Atlantic City meeting. They are Dr. Halim J. Dewlett, Dr. Papken S. Mugrditchian, and Dr. Charles N. Nucho. All of these Fellows are studying in the United States.

New Zealand:

Dr. Rowan Nicks of Auckland, New Zealand, was a guest at the annual meeting of the College in Atlantic City.

Palestine:

One physician from Palestine attended the College meeting; he was Dr. Juda Pazuener.

Philippine Islands:

Dr. Miguel Canizares, Governor of the College for the Philippine Islands, and Medical Director of the Quezon Institute in Manila, was present in Atlantic City for the College meeting. This was Dr. Canizares' first visit to the United States since before the war, and he is making an extensive tour of the country before his return home.

Convocation

The Second Annual Convocation of the College was held June 7, 1947 and the following physicians received their Fellowship Certificates and signed the College Roster:

Michael Aronovitch, M.D., Montreal, Quebec, Canada
Morris M. Braverman, M.D., Detroit, Michigan
Albert E. Broome, M.D., Kitchener, Ontario, Canada
William W. Coulter, M.D., Sanatorium, Texas
James H. Cullen, M.D., Yonkers, New York
Sheldon E. Domm, M.D., Knoxville, Tennessee
Louis L. Friedman, M.D., Birmingham, Alabama
Peter J. Galante, M.D., Swannanoa, North Carolina
Herman Gauthier, M.D., Mont Joli, Quebec, Canada
Robert Hunter Hayes, M.D., Chicago, Illinois
George R. Hodell, M.D., Houston, Texas
Perry M. Huggin, M.D., State Park, South Carolina
Harold A. Kipp, M.D., Pittsburgh, Pennsylvania
Valmore Latraverse, M.D., Montreal, Quebec, Canada
Ralph Edward Moyer, M.D., Oteen, North Carolina
James D. Murphy, M.D., Oteen, North Carolina
J. Louis Pilon, M.D., Montreal, Quebec, Canada
Berthold S. Pollak, M.D., Jersey City, New Jersey
Benjamin Paul Potter, M.D., Jersey City, New Jersey
Arthur Powers, M.D., Hull, Quebec, Canada
Walter Raab, M.D., Glenn Dale, Maryland
Leon Ross, M.D., Brecksville, Ohio
William Ray Rumel, M.D., Salt Lake City, Utah
John Edmund Runnells, M.D., Scotch Plains, New Jersey
Irving W. Schiller, M.D., Boston, Massachusetts
Clarence B. Schoemperlen, M.D., Winnipeg, Manitoba, Canada
Elias A. Sindel, M.D., Bethlehem, Pennsylvania
Morris M. Snyder, M.D., Chicago, Illinois
M. M. Szucs, M.D., Youngstown, Ohio
Ernest Teller, M.D., Chicago, Illinois
Paul G. Thode, M.D., Fort Bayard, New Mexico
John Watkins Trenis, M.D., Washington, D. C.
Ruth Wells, M.D., Pasadena, California
John Alexander Wiggins, Jr., M.D., Fort Worth, Texas

Report of the Executive Secretary

Another year has come and gone since we last met in San Francisco. This past year has been one of readjustment. Many of the College Fellows and Associate Members have been released from the armed services and in order to assist these members in readjusting themselves to civilian life your President, Dr. Charles M. Hendricks, has appointed a Veteran Medical Officers Committee. This Committee is comprised of members of the College who served with our armed forces. The Committee, through the Medical Service Bureau of the College, has made it possible for many physicians to obtain positions in sanatoria, hospitals, and other affiliations. This service is offered gratis to all members of the College and we urge those members who are still looking for positions or who have positions to offer to communicate with the Medical Service Bureau of the College. The Veterans Medical Officers Committee is considering other valuable services for the benefit of their fellow veterans and these will be announced by the Committee as soon as the organization for the administration of these services have been completed.

All of the established councils and committees of the College have been active during the past year and you will hear the reports from the chairmen of these councils and committees during this session. I am sure that you will agree with me that the men who serve on these councils and committees, who have given up a great deal of their time and have traveled to meetings at their own expense, deserve the praise and cooperation of every member of the College. These are the type of men who have built the American College of Chest Physicians to its present high standing in the medical profession.

We can be proud of the Governors and Regents of the College. They are doing yeoman duty and are maintaining the prestige of the College by selective membership. They too, deserve the praise and cooperation of every member of the College.

During the interval between College meetings, the affairs of the College are handled by the Executive Council. In all of my years of working with these officials, I can truthfully say that the members which you have selected to serve on the Executive Councils have given unstintingly of their time and efforts to make the College the kind of a society in which you are proud to hold Fellowship. Without the aid of all of these men and many others too numerous to mention, it would be impossible to bring you this report.

The life-blood of the American College of Chest Physicians is in its chapters. It is only fitting and proper that the future leaders of the College should come up from the ranks through College chapters. The College chapters serve as a sounding-board for the selection of these future leaders. We hope that many of you will take advantage of these opportunities.

The establishment of a proper board for certification of chest specialists is one of the prime objectives of your College and a committee of the College has been working on this problem for a number of years. They will continue the work until this objective is obtained.

Another objective of the College is to establish sections on diseases of the chest in the recognized state and national medical societies. Here, too, progress is being made. We are pleased to announce that the New York State Medical Society at its last annual meeting established a section on diseases of the chest.

The program of the National Council of Tuberculosis Committees of your College to establish tuberculosis committees in every state medical society is now nearing completion. It is hoped that tuberculosis committees will also be organized in many of the county medical societies.

Your Council on Undergraduate Medical Education is sponsoring two books for undergraduate medical students, one on tuberculosis and one on non-tuberculous diseases of the chest. These books are being published by the Charles C. Thomas Company, Springfield, Illinois, and we hope that they will soon be available for distribution.

In postgraduate medical education your Council has arranged the second comprehensive postgraduate course in diseases of the chest to be given in Chicago, September 15-20, under the direction of the Illinois Chapter of the College. The last postgraduate course sponsored by the Illinois Chapter was well received and we know that this course will be even more popular. Similar courses are being planned to be given in other parts of the country and they will be announced in the journal when arrangements have been completed. The emphasis in these courses will be placed on the newer developments in all aspects of diagnosis and treatment of diseases of the chest.

These are but a few highlights of the extensive program which your College has undertaken. Each of them is designed to serve the public and the chest specialist. We believe that medical problems should be handled by physicians who are affiliated with recognized medical societies and we further believe that a specialty society should be comprised of specialists who have met minimum requirements and have passed adequate examinations in their respective fields of endeavor.

We are happy to announce that 72 candidates for Fellowship in the College took their examinations in Atlantic City yesterday.

No report by your Executive Secretary would be complete without mentioning our excellent journal, "Diseases of the Chest". Under the editorship of Dr. Jay Arthur Myers and his splendid editorial board, the journal has reached new pinnacles of success. It is regarded as the leading journal on diseases of the chest in every country throughout the world. From a small beginning, only a few years back, this outstanding achievement is worthy of note and I am sure that the members of the College join with me in paying tribute to the men who have guided the destiny of our journal since its inception.

The new College Directory, listing 2272 members, is now on the press and, barring unforeseen delays, the Directory should be available to the members within the next few months.

One of the notable achievements of the College has been its expansion into other countries and we can truly say that the College today is a world organization.

Our Council on Pan Pacific Affairs reports the growth of the College membership in Australia, China, India, New Zealand, the Philippine Islands, South Africa, Alaska and Hawaii. Our Council on European Affairs has recently begun to function in Europe and we are pleased to announce that in addition to the College chapter in Greece, we now have members in England, Belgium, Switzerland, Norway, Sweden, Egypt, Lebanon, Portugal, Yugoslavia and Italy. Negotiations are now under way to organize all of the European countries and we hope to be able to announce the completion of this organization in the very near future.

It gives me a great deal of pleasure to report to you concerning our activities in the Latin American countries. I have just returned from

an extensive tour of Central and South America. My first stop was in Mexico where I met with the College members. Mexico has a very active chapter with 39 members and plans were discussed for increasing their membership as well as conducting examinations for Fellowship. I am pleased to announce that these examinations will go into effect on January 1, 1948.

After leaving Mexico I visited Guatemala, Costa Rica, and the Republic of Panama where plans were discussed for the organization of a Central American Chapter of the College. I am happy to report to you that this chapter will be organized at San Salvador in August of this year.

I then went to Lima, Peru, to attend the 7th Latin American Congress Against Tuberculosis. In addition to many College members and officials from the Latin American countries, the College was represented by a delegation from the United States comprising Dr. Chevalier L. Jackson, Chairman of the College Council on Pan American Affairs, Dr. Leo Eloesser, Vice-Chairman of the Council on Pan American Affairs, Dr. Jay Arthur Myers, Editor-in-Chief of our journal "Diseases of the Chest," and Dr. Richard H. Overholt, First Vice-President of the College. Dr. Herman E. Hilleboe, a member of our Council on Public Health, attended the Congress as an official representative of the U. S. Public Health Service.

A conference of Governors, Regents and other College officials in the Latin American countries was held on March 19, and a reunion of all College members was held on March 21. These College activities were a part of the Congress and were published in the official program of the meeting.

The 8th Latin American Congress Against Tuberculosis will be held in Mexico City in 1949 and we are pleased to announce that Dr. I. Cosio Villegas, Governor of the College for Mexico, has been elected as President. We have assured Dr. Cosio Villegas that we will have a large College delegation at the meeting in Mexico City in January 1949. Here will be an opportunity for the Fellows in the United States and Canada to meet with the Fellows of the College from all other countries in the Western Hemisphere. You will find them to be splendid fellows and gracious hosts.

Following the Congress at Lima, I proceeded to Chile where a chapter of the College was organized with 51 charter members. Membership applications are still arriving from Chile and we have been promised that there will be at least 75 members in the Chilean chapter.

My next stop was in the Argentine. Here a meeting was arranged by the Argentine Chapter of the College. Plans were discussed for the expansion of College activities there and for the conduct of examinations for Fellowship. We have already received a large number of new applications from the Argentine and we now have a very active College chapter functioning in that country with 66 members.

From the Argentine I flew over to Uruguay where a meeting was arranged by our colleagues in that country. Plans were discussed for expanding our activities in Uruguay and they have requested us to send them 100 application forms.

My next stop took me to Brazil and meetings were held in Sao Paulo and Rio de Janeiro. A luncheon meeting was sponsored by the central chapter of the College in Rio de Janeiro and this meeting was attended by 54 College members. It was decided that there be at least three

College chapters established in Brazil and possibly a fourth one. The country has been divided into southern, central and northern districts, comprising 19 states and the Federal District, and we are pleased to announce that two of these chapters are already functioning. We hope to be able to announce the organization of a third chapter within the next few months.

From Brazil I had a long flight to Puerto Rico where our College chapter there had arranged a meeting. I am very happy to tell you that the College has a splendid chapter in Puerto Rico of which we may be proud. They are doing good work there and a resolution was adopted at their meeting to establish a board of examiners and commence examining candidates for Fellowship in the College beginning the first of the year.

In all of the countries that I visited the College members were most gracious hosts. Their homes and their hearts were opened to us. I felt that I was not only meeting members of the College, but that I was meeting with warm friends. It was with reluctance that I left each of the countries which I was so fortunate to be able to visit.

It was most fortunate that Dr. and Mrs. Overholt chose this particular time to visit the same countries which I did, and I can say that they were among our best ambassadors of good will. Dr. Overholt gave a series of lectures in each of the countries and they were very well received. I cannot praise too highly the wonderful assistance which he gave to us in our efforts to organize the chest doctors in the Latin American countries. Following his series of lectures in Brazil, Dr. and Mrs. Overholt flew to Venezuela where Dr. Overholt participated in the organization of the Venezuelan Chapter of the College. We have just received a cable from Dr. Baldo, the Governor of the College for Venezuela, announcing this latest addition to our fast-growing family of College chapters.

I wish to extend my deep appreciation and thanks to the many College members in the Latin American countries who helped make this trip so enjoyable. Some of them are attending our meeting here in Atlantic City and we hope that the members of the College in the United States will be just as gracious to them as they have been to me and to your other delegates.

In closing, I want to express my appreciation and thanks to the members of our office staff in Chicago, who have carried on the work of the College during my absence from the country and have so ably assisted me in all of the College activities during the past year. Their loyal support and assistance has helped to make this report of progress possible.

The American College of Chest Physicians, by its world organization is demonstrating the road to peace through cooperation. Here is a wonderful opportunity for men of good will to band together for a common purpose. Disease knows no boundaries. The tubercle bacillus is the same in the Western Hemisphere, Europe, Asia, or any other continent. The distance between countries is being shortened by rapid air travel. To eradicate tuberculosis in one country, we must eradicate it in every other country. Science must find the answers to these problems and it must lead the way. The American College of Chest Physicians intends to do its full part in this progressive movement.

Report of the Historian

Mr. President, Distinguished Guests and Fellows of the American College of Chest Physicians:

It is fitting and proper that we now pause and give thought to the *physicians* who have prepared and passed on to us a glorious heritage as *physicians*.

The title *physician* is one which stirs in our mind thoughts of men inspired with a love for humanity and a burning desire to relieve the sick and ailing.

The philosophy of medicine is synonymous with the name of Hippocrates. Our thoughts are directed toward physiology by Erasistratus. The birth of anatomy is inevitably linked with Galen and his eager students who traveled far that they might see his anatomical dissections. New anatomical truths are put forth and established by Vesalius. Harvey insists that we must recognize the linking of the circulation through the capillary vessels. Now come Monro, Turner, Hunter and Padgett to teach the art of surgery founded upon anatomy. A new vista opens to those who will but pause to look through Leeuwenhoek's microscope.

A terrible stench now assails our nostrils. It comes from the amputation wards. Fright, pain and suffering is written on the countenance of each patient. Death lurks in every nook and cranny of the wards only to be routed by that noble Englishman, Lister, with his carbolic spray (antiseptic surgery). Even now, the energetic Frenchman, Pasteur, is here to tell us that the true cause of such stenches lies in an invisible germ. Semmelweis is standing guard at the birth chamber protecting the birth canal against contamination by meddlesome hands soiled with germs. We cannot pause, a host of eager faces appear, among whom I see Laennec, Beaumont, Morton, Virchow, Koch, Osler, Walter Reed and Forlanini. Halsted is here and the dawn of aseptic surgery is upon us!

Man is destined to bear the frailties of human nature and is prone to err in judgment but the true *physician* never allows his trust to be violated. New faces continue to appear, each illuminated through the knowledge of a task well done and of a trust held inviolable.

John S. Agar, Little Rock, Arkansas
Henry Barenblatt, Browns Mills, New Jersey
James Marr Bisailon, Portland, Oregon
Earl C. Carr, Washington, D. C.
William A. Clark, Springfield, Ohio
John Donnelly, Charlotte, North Carolina
Frank G. Dye, Syracuse, New York
Lee T. Ferrell, Albuquerque, New Mexico
Clyde M. Fish, Pleasantville, New Jersey
Champ H. Holmes, Atlanta, Georgia
Samuel H. James, San Fernando, California
George A. Lassman, New York, New York
Yvon Laurier, Montreal, Canada
Torrence C. Moyer, Lincoln, Nebraska
Ira D. Nelson, Albuquerque, New Mexico
Michael Smith, West Palm Beach, Florida
Hyman I. Spector, St. Louis, Missouri
Arthur Bruce Steele, Santa Barbara, California
Fred D. Stubbs, Philadelphia, Pennsylvania

Adam L. Szwajkart, Chicago, Illinois
Angel B. Trinidad, Manila, Philippine Islands
Joseph Walsh, Philadelphia, Pennsylvania
Daniel Yellin, San Francisco, California

May we now stand in silent tribute to these physicians who have fulfilled their trust. At this time we renew our pledge to protect and nurture our glorious medical heritage.

Respectfully submitted,
William A. Hudson, M.D., F.C.C.P.

College Activities in Latin America

Argentine Chapter:

The Buenos Aires members of the Argentine Chapter of the College sponsored a luncheon meeting at the Restaurant La Cabana, Buenos Aires, on April 16 (see photograph). Dr. Raul F. Vaccarezza, Governor of the College for Argentina, presided and introduced Dr. Richard H. Overholt, Brookline, Massachusetts, President-Elect, and Mr. Murray Kornfeld, Executive Secretary, of the College. Mr. Kornfeld read a prepared talk in Spanish outlining the activities of the College. Dr. Overholt gave a series of lectures in Buenos Aires, Cordoba and Rosario. The lectures were demonstrated with slides and motion pictures and a great deal of enthusiasm for the lectures was shown by the members of the College in the Argentine. The following are the officers of the Argentine Chapter:

Gumersindo Sayago, M.D., Cordoba, Regent
Raul F. Vaccarezza, M.D., Buenos Aires, President
Agustin Caeito, M.D., Cordoba, Vice-President
Alvaro E. Bence, M.D., Buenos Aires, Secretary-Treasurer

Three officially appointed delegates from Argentina attended the Thirteenth Annual Meeting of the College in Atlantic City, June 5-8. There were: Dr. Manuel Albertal, Buenos Aires; Dr. Alberto Chattas and Dr. Gonzalez Aguilar, Cordoba.

Conference in Montevideo, Uruguay:

A Conference was held at the Medical Society Building in Montevideo on April 26 with officials of the Tuberculosis Society of Uruguay. Plans for the organization of a chapter of the College in Uruguay were discussed and Dr. Abelardo Rodriguez, Secretary of the Tuberculosis Society of Uruguay was authorized to send applications for Fellowship and Associate Membership in the College to all physicians in that country who are eligible to apply and who can meet the minimum requirements for such membership. The Conference was attended by the following physicians: Alfonso Civici, M.D., Mariano Sicardi, M.D., Ariztes Piaggio, M.D., Raul A. Piaggio Blanca, M.D., Pablo Purriel, M.D., Alijandro Artagabeytia, M.D., and Abelardo Rodriguez, M.D.

The plan for the organization of an Uruguay Chapter of the College was endorsed by Dr. Rodolfo Almeida Pintos, President of the Tuberculosis Society of Uruguay. Dr. Fernando Gomez, Governor of the College for Uruguay was unable to attend the Conference because of illness.

LUNCHEON MEETING, ARGENTINE CHAPTER

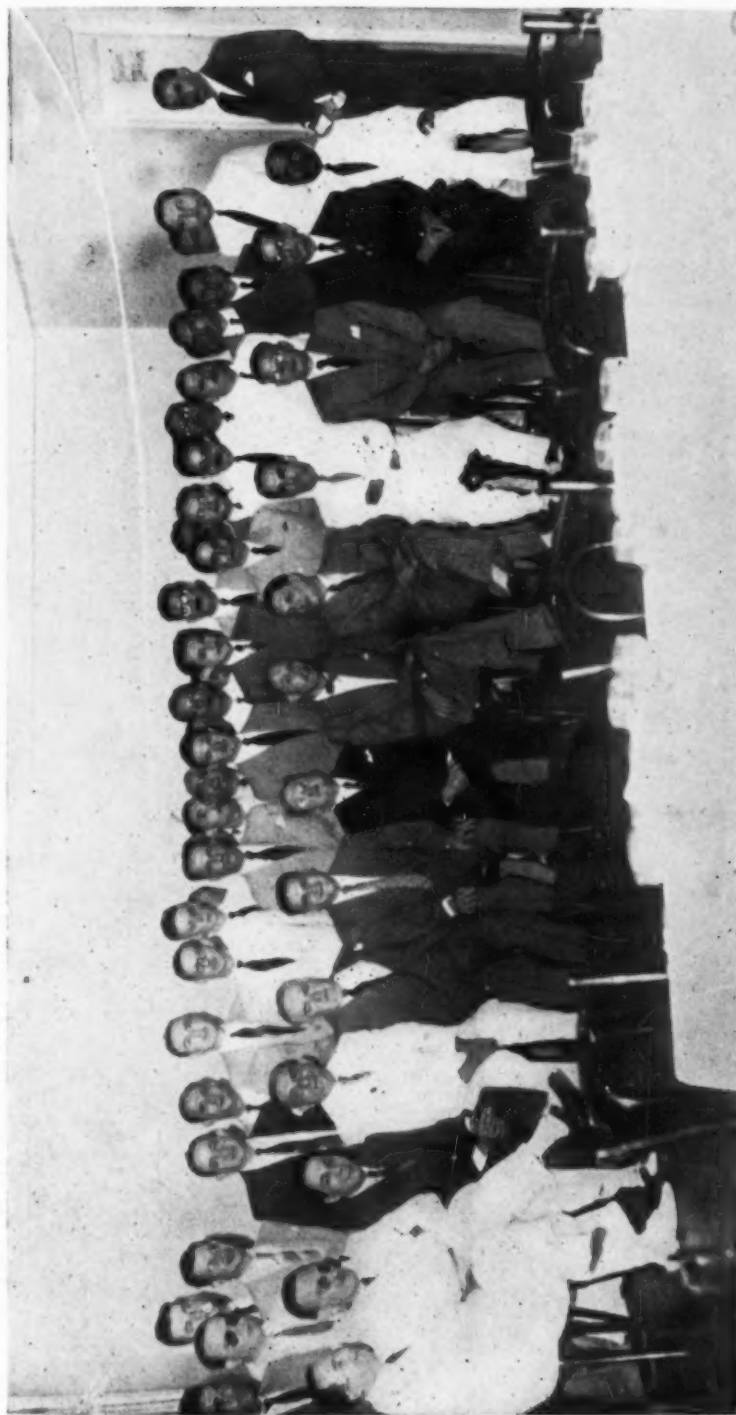
American College of Chest Physicians, Buenos Aires, Argentina, April 16, 1947



Members and guests of the American College of Chest Physicians who attended the luncheon meeting sponsored by the Argentine Chapter of the College at the Restaurant La Cabana, Buenos Aires, April 16, 1947.

LUNCHEON MEETING, CENTRAL BRAZILIAN CHAPTER

American College of Chest Physicians, Rio de Janeiro, Brazil, May 10, 1947



Members and guests of the American College of Chest Physicians who attended the luncheon meeting sponsored by the Central Brazilian Chapter of the College at the Casa do Estudante, Rio de Janeiro, Brazil, May 10, 1947.

Conference in Sao Paulo, Brazil:

A Conference was held with Dr. Eduardo Etzel, Sao Paulo, Governor of the College for Southern Brazil and plans were completed for the organization of a College chapter in Southern Brazil comprising the states of Rio Grande Do Sul, Santa Catarina, Parana and Sao Paulo. The College now has a number of members in these states and under Dr. Etzel's leadership a sufficient number of new members are being added to support this new chapter.

Central Brazilian Chapter:

A luncheon meeting was given in Rio de Janeiro on May 10 by the Central Brazilian Chapter of the College in honor of Dr. Richard H. Overholt, President-Elect, and Mr. Murray Kornfeld, Executive Secretary, of the College. (See photograph). A number of talks were given by officials of the chapter and each speaker stressed the need for close cooperation between physicians everywhere in the world who specialize in chest diseases. Dr. Affonso MacDowell, Regent of the College for Brazil, was presented with a token of esteem by Dr. Overholt in behalf of the Board of Regents of the College. The following officers were elected and committee appointments made:

Affonso MacDowell, M.D., Regent
Reginaldo Fernandes, M.D., Governor
Mazzine Bueno, M.D., President
Ugo Pinheiro Guimaraes, M.D., Vice-President for the Federal District
Jose Amello, M.D., Vice-President for the State of Rio de Janeiro
Jaime Santos Neves, M.D., Vice-President for the State of
Espirito Santo
Gastao Mattos, M.D., Vice-President for the State of Minas Gerais
Affonso MacDowell Filho, M.D., Secretary
J. M. Castello Branco, M.D., Treasurer
Manoel de Abreu, M.D., Chairman,
Committee on Mass X-Ray Examination
Arlindo de Assis, M.D., Chairman, Committee on B. C. G.
Rafael de Paula Souza, M.D., Chairman, Committee on Public Health
Alberto Renzo, M.D., Chairman, Committee on Hospitals
Valois Souto, M.D., Chairman, Committee on Sanatoria
J. Carvalho Ferreira, M.D., Chairman, Committee on Social Welfare
Aresky Amorim, M.D., Chairman, Committee on Thoracic Surgery
Aloisio de Paula, M.D., Chmn., Committee on Med. Collapse Therapy
Ari Miranda, M.D., Chairman, Committee on Chemotherapy
A. Ibiapina, M.D., Chairman, Committee on Medical Education

Following the luncheon, Dr. Overholt showed a film on lung resection.

Puerto Rico Chapter:

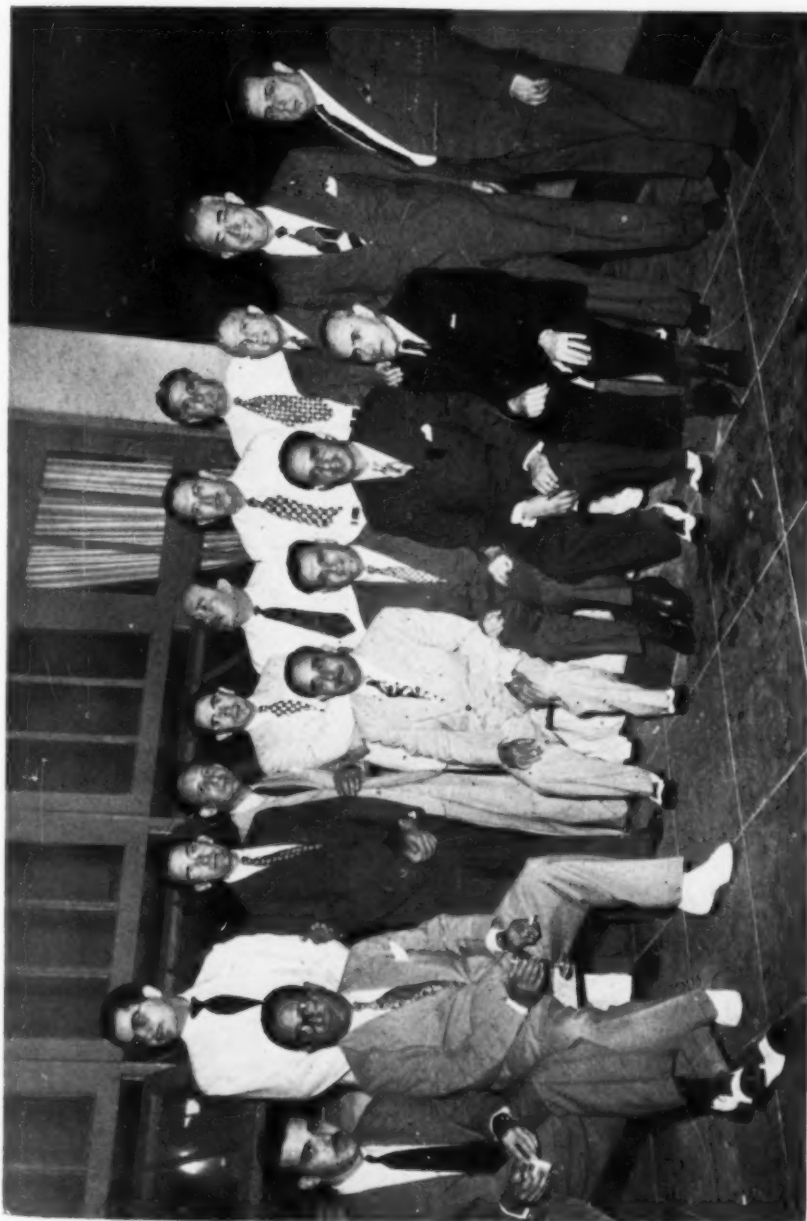
A dinner meeting was given on May 14 at the Hotel Condado, San Juan, Puerto Rico, by the Puerto Rico Chapter of the College, at the time of Mr. Kornfeld's visit there. (See photograph). Dr. Jaime Pou, President of the Puerto Rico Chapter of the College presided and Mr. Kornfeld addressed the members of the chapter on the need for world organization in the specialty of diseases of the chest. The meeting was also addressed by the Commissioner of Health of Puerto Rico. A resolution was adopted by the Puerto Rico Chapter stating that examinations for Fellowship in the College will be given to all new applicants commencing January 1, 1948. The following delegates were designated by

the chapter to attend the Thirteenth Annual Meeting of the College in Atlantic City: Antonio Acosta Velarde, M.D., Santurce; Ramon T. Colon, M.D., San Juan; Rivero E. Martinez, M.D., Hato Rey; Felix M. Reyes, M.D., Bayamon; and Juan H. Font, M.D., San Juan.

The officers of the Chapter are:

David E. Garcia, M.D., Hato Rey, Regent
A. M. Marchand, M.D., Santurce, Governor
Jaime F. Pou, M.D., Hato Rey, President
Jose A. Amadeo, M.D., Aibonito, Vice-President
Fernando L. Buxeda, M.D., Rio Piedras, Secretary-Treasurer

DINNER MEETING, PUERTO RICO CHAPTER
American College of Chest Physicians, San Juan, Puerto Rico, May 14, 1947



Members and guests of the American College of Chest Physicians who attended the dinner meeting sponsored by the Puerto Rico Chapter of the College at the Hotel Condado, San Juan, Puerto Rico.

Second Annual Postgraduate Course in Diseases of the Chest

AMERICAN COLLEGE OF CHEST PHYSICIANS

Sponsored by the Illinois Chapter

September 15 - 20, 1947

A second annual postgraduate course in diseases of the chest will be given by the American College of Chest Physicians at the Municipal Tuberculosis Sanitarium, Chicago, Illinois, September 15-20, inclusive. This course will be sponsored by and under the active direction of the Illinois Chapter and the Council on Postgraduate Medical Education of the College.

This course is intended to present authoritative information on all of the important recent developments in the diagnosis and treatment of diseases of the chest. For this reason primary and basic material has been eliminated except as it relates to more recent advances.

A feature of the course again will be the luncheon round table discussions, including question and answer periods on controversial matters.

To insure informality and individual attention, the class is limited to thirty members. The tuition fee is \$50.00. When the class is filled no further applications will be accepted. Requests for further information should be sent to the Executive Offices of the College in Chicago. A coupon has been inserted on page ix of the front pages of this issue to facilitate application.

Hotel accommodations convenient to the location of the course will be arranged on request at the time of acceptance of applications.

An interesting and stimulating program of courses has been arranged by the Medical Education Committee of the Illinois Chapter: Dr. Edwin R. Levine, Chicago, Chairman; Dr. Paul H. Holinger, Chicago; Dr. Minas Joannides, Chicago; and Dr. Arthur S. Webb, Glen Ellyn, Member Ex-Officio.

POSTGRADUATE COURSE IN DISEASES OF THE CHEST

SEPTEMBER 15 - 20, 1947

TIME	MONDAY	TUESDAY	WEDNESDAY
9:00 a. m.	Diagnostic Approach to Chest Diseases	Pulmonary Virus Infections	Pneumoconiosis
10:00 a. m.	Methods of X-Ray Diagnosis	Pulmonary Fungus Infections	Causes of Pulmonary Disability in Emphysema
11:00 a. m.	X-Ray Diagnosis of Chest Diseases	Nebulization Therapy in Chronic Bronchial Infections	Cardiac Factors in Pulmonary Disease
Luncheon Round Table 12:00-2:00	Correlation of X-Ray, Pathological, and Clinical Findings	Acute Pulmonary Conditions	Employability of Respiratory Patients

TIME	MONDAY	TUESDAY	WEDNESDAY
2:00 p. m.	Pulmonary Segments in Relation to Broncho-Pulmonary Disease	Bronchogenic Carcinoma	Treatment of Asthma
3:00 p. m.	Laboratory Methods in Diagnosis of Chest Diseases	Mediastinal Tumors	Relation of Allergy to Pulmonary Disease
4:00 p. m.	Use and Abuse of Bed-Rest	Chest Symptoms of Esophageal Disease	Cardiac Surgery

TIME	THURSDAY	FRIDAY	SATURDAY
9:00 a. m.	Epidemiology and Control of Tuberculosis	Immobilization of the Lungs in Treatment of Tuberculosis	Clinical Diagnostic Conference
10:00 a. m.	Diagnosis of Tuberculosis and Evaluation of Activity	Physical Exercise in Treatment of Tuberculosis	Clinical Diagnostic Conference
11:00 a. m.	Treatment and Prognosis of Tuberculosis in Children	Surgery of Pulmonary Tuberculosis	Clinical Diagnostic Conference
Luncheon Round Table 12:00-2:00	B. C. G.	Rehabilitation	
2:00 p. m.	Principles of Treatment of Pulmonary Tuberculosis	Psychosomatic Factors in Tuberculosis	
3:00 p. m.	The Effect of Antibiotics on the Tubercle Bacillus	Allergy and Immunity in Tuberculosis	
4:00 p. m.	Clinical Application of Antibiotics in Tuberculosis	Effect of Weather on Tuberculosis	

DR. OVERHOLT LECTURES IN SOUTH AMERICA

Following Dr. Overholt's lecturing tour through Peru and Chile, as published in the May-June issue of "Diseases of the Chest," he continued his trip through South America and gave lectures in Buenos Aires, Argentina, Montevideo, Uruguay, Sao Paulo and Rio de Janeiro, Brazil, and Caracas, Venezuela.

College Chapter News

GREEK CHAPTER

The Greek Chapter of the College had its Second Annual Meeting in Athens on May 10, 1947. The newly elected officers for the chapter are as follows:

Basil Papanikolaou, M.D., Athens, President
Kyriakos Katrakis, M.D., Athens, Vice-President
Nikolaos Jannopoulos, M.D., Athens, Secretary-Treasurer

POTOMAC CHAPTER

The Maryland - District of Columbia Chapter of the College presented a resolution before the meeting of the Board of Regents of the College at Atlantic City for approval to change the name of the chapter to the "Potomac Chapter". The resolution was accepted by the Board and the chapter will now be known as the "Potomac Chapter". The chapter comprises the states of Maryland and West Virginia and the District of Columbia.

MICHIGAN CHAPTER

The Michigan Chapter of the College held an interesting meeting in Detroit on the evening of June 27 with a good attendance of members and invited guests. The special guest speakers of the evening were Dr. Clifford Hoyle and Dr. Kenneth Robson, of London. Drs. Hoyle and Robson attended the College meeting in Atlantic City and are now visiting various parts of the United States.

TEXAS CHAPTER

The Sixth Annual Meeting of the Texas Chapter of the American College of Chest Physicians was held at the Baker Hotel, Dallas, Texas, on May 5, 1947. The program as published in the March-April issue of "Diseases of the Chest" was presented with the following exceptions: In the place of paper number 3, Dr. Howard Smith, F.C.C.P., of Austin, read a paper on "The Importance of Having a Tuberculosis Committee in Each County Medical Society;" and the subject of paper number 5, by Dr. John Wiggins, F.C.C.P., of Fort Worth, was "Pulmonary Emphysema," instead of "Pulmonary Embolism".

At the business session in the evening, President McCorkle made a report on the work of the Chapter for the preceding year. The report of the Secretary-Treasurer was read and approved. Dr. Howard Smith gave the following report of the Nominating Committee:

H. Frank Carman, M.D., Dallas, President
Robert B. Homan, M.D., El Paso, First Vice-President
Elliott Mendenhall, M.D., Dallas, Second Vice-President
Charles J. Koerth, M.D., Kerrville, Secretary-Treasurer

The officers named above were unanimously elected. Thirty-three members and eleven guests registered for the meeting.

VENEZUELAN CHAPTER ORGANIZED

A cablegram was received from Dr. Jose Ignacio Baldo, Caracas, Venezuela, Governor of the College for Venezuela, announcing the organization of the Venezuelan Chapter at Caracas on May 20. Dr. Richard H. Overholt, Brookline, Massachusetts, President-Elect of the College, was lecturing in Caracas at the time and took part in the organizational meeting.

VIRGINIA CHAPTER

The Second Annual Meeting of the Virginia Chapter of the College took place at the Pine Camp Hospital, Richmond, Virginia, on Monday, June 23. The following program was presented:

"Sarcoidosis"

Edward S. Ray, M.D., Richmond.

"The Use of Streptomycin in Tuberculosis"

Wyatt E. Royce, M.D., Brook Hill.

"Bronchography"

L. J. Buis, M.D., F.C.C.P., Richmond.

"Bronchiectasis"

Frank Phillip Coleman, M.D., Richmond.

"Bronchogenic Carcinoma"

M. L. White, M.D., Charlottesville.

"Prolonged Pulmonary Suppuration"

E. C. Drash, M.D., F.C.C.P., Charlottesville.

A Chapter luncheon was held after which an X-ray Conference was presented. The officers of the Virginia Chapter for 1946-47 were: Lemuel E. Broome, M.D., Danville, President; Edward S. Ray, M.D., Richmond, Vice-President; George Welchons, M.D., Richmond, Secretary-Treasurer. The newly-elected officers of the chapter will be announcer later. Dr. Carl W. LaFratta, Richmond, served as Chairman of the Arrangements Committee for the meeting.

WISCONSIN CHAPTER

The Milwaukee Metropolitan Section of the Wisconsin Chapter of the College met for dinner at the Medford Hotel on February 28, 1947. Dr. Laurie Lee Allen addressed the meeting on the subject "Non-Tuberculous Pulmonary Lesions". A round-table discussion followed.

The dinner meeting on March 28, of the Milwaukee Metropolitan Section, was addressed by Dr. Karl Kassowitz who spoke on "Tuberculosis in Children". This was followed by a round-table discussion.

DR. GEORGE R. MAXWELL'S BROTHER WINS CADILLAC

Dr. Cyrus H. Maxwell, Albany, New York, brother to Dr. George R. Maxwell, Morgantown, West Virginia, Governor of the College for that state, won the 1947 Cadillac Club Coupe which White Laboratories gave away at the annual meeting of the American Medical Association in Atlantic City. More than 12,300 doctors registered from Monday, June 9, through Thursday, June 12, for tickets on the car.

Medical Service Bureau

POSITIONS AVAILABLE

Approved Tuberculosis Sanatorium desirous of obtaining applications for residencies beginning July 1st. All types of compression and surgical therapy in the modern treatment of tuberculosis; 200 bed hospital; salary range \$190 - \$300; applicants please state experience, previous training, age and social background, etc. Please address Box 154A, American College of Chest Physicians, 500 North Dearborn Street, Chicago 10, Illinois.

Resident physician wanted for 80 bed tuberculosis sanatorium approved by the A.M.A. and American College of Surgeons. Salary to \$250 plus complete maintenance for single man. Send photograph and complete record of training and experience in first letter. Dr. D. F. Loewen, Medical Director, Macon County Tuberculosis Sanatorium, Decatur, Illinois.

Full time resident physician wanted at tuberculosis hospital; all phases of chest work; \$350 per month with maintenance for man and wife; three room apartment. For further information please address Box 156A, American College of Chest Physicians, 500 North Dearborn Street, Chicago 10, Illinois.

Resident staff physician wanted at 200 bed tuberculosis sanatorium; all forms of collapse therapy, major surgery, bronchoscopy. Salary \$3,700 with complete maintenance. For further information address Box 157A, American College of Chest Physicians, 500 North Dearborn Street, Chicago 10, Illinois.

Senior Staff physician and residents wanted at large tuberculosis sanatorium; full time departments in pathology and thoracic surgery; medical school affiliation; \$4800 to \$5400 per annum; complete or partial maintenance. For further information please address Box 158A, American College of Chest Physicians, 500 N. Dearborn Street, Chicago 10, Illinois.

Expansion King County Tuberculosis Hospitals in Seattle, requires additional staff. Excellent facilities, equipment. University Medical School affiliation. Young men, good training, interested teaching and research preferred. Chiefs of Service, \$8400; Staff Physicians, \$7200; Resident Physicians, \$1800, plus free maintenance; Laboratory Technician, \$2820; X-ray Technician, \$2520; Medical Record Librarian, \$2400. Maintenance at cost for single persons only. Write Firland Sanatorium, Richmond Highlands, Washington, giving full particulars and enclose photograph.

Single physician wanted with at least three years sanatorium experience in diagnosis and treatment of tuberculosis; 125 bed tuberculosis hospital in Hawaii. Starting salary \$6400.00 and complete maintenance. Send full credentials and available data first letter. Please address Box 159A, American College of Chest Physicians, 500 N. Dearborn Street, Chicago 10, Illinois.

Physicians wanted at small, privately endowed, Jewish institution with 25 beds, one physician. For further information please address Box 165A, American College of Chest Physicians, 500 North Dearborn Street, Chicago 10, Illinois.

Position available for physician who has had some training in thoracic surgery or is interested in learning thoracic surgery at sanatorium in northwest. Salary at least \$300 per month with maintenance. Opportunity to advance. For further information please write Box 167A, American College of Chest Physicians, 500 N. Dearborn Street, Chicago 10, Illinois.

Physician wanted, experienced in tuberculosis for position of Assistant Director of Tuberculosis Control in city-county health department of midwest community; \$4,500 with full maintenance. For additional information please address Box 168A, American College of Chest Physicians, 500 North Dearborn St., Chicago 10, Illinois.

Staff physician wanted at tuberculosis hospital in midwest. Starting salary \$275 plus maintenance for self and family. For additional information please address Box 169A, American College of Chest Physicians, 500 N. Dearborn Street, Chicago 10, Illinois.

Assistant Resident Physician with some tuberculosis experience wanted for 120-bed bi-county institution. All phases of the diagnosis and treatment of tuberculosis are carried out including major surgery. California license required although not immediately. Furnished apartment is provided for single person or married couple. Please outline training and experience in first letter and include a recent snapshot. Salary starts at \$425 per month. Write Director, Tulare - Kings Counties Joint Tuberculosis Hospital, Springville, California.

POSITIONS WANTED

Trained chest surgeon desires position as medical director of tuberculosis sanatorium, or as chest surgeon. For further information please address Box 233A, American College of Chest Physicians, 500 North Dearborn Street, Chicago 10, Illinois.

